

THE FAMILY DIASTYLIDAE (PART 2) *GYNODIASTYLIS*
AND RELATED GENERA

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Fig. 1-60.

INTRODUCTION.

A FEW Diastylids have been described which are separated from all others by the facts that while the female third maxilliped lacks an exopod the male has no trace of pleopods. Species previously known to have these characters in combination have been placed in three genera, *Gynodiastylis* Calman, *Allodiastylis* Hale and *Dic* Stebbing; the female is unknown in the genotype of the last-named but as stated by Zimmer (1914, p. 192) it seems undoubtedly very close indeed to *Gynodiastylis*.

Australian species belonging to *Gynodiastylis* and to some other genera with subcordate, subcylindrical or short and plump telson show that a reduction to vanishing point of the pair of terminal telsonic spines so generally typical of the family is not a very significant feature, and by itself cannot be relied upon as a generic character; in *Allodiastylis* and *Zimmeriana* gen. nov. there is sexual difference in the armament of the telson (see also Hale, 1945, p. 179).

The group under discussion is well represented in Australian waters and twenty-six new species, mostly from off the eastern coast, are herein described. Although, unfortunately, few of these can be included in them, three new genera are proposed in an effort towards preventing *Gynodiastylis* (which as it is now includes a very varied assemblage of forms) from eventually becoming the repository for a large number of unclassified species.

FAMILY DIASTYLIDAE.

KEY TO GENERA OF *DIC-GYNODIASTYLIS* GROUP.

1. Third maxilliped with ischium greatly expanded *Dic* Stebbing.
- Third maxilliped with ischium not expanded 2.
2. Female with exopods on at least first and second peracopods. Adult male (where known) with terminal telsonic spines absent or similar to those of female 3.
- Female with thoracic exopods completely absent. Adult male with terminal telsonic spines which are long and bristle-like, much greater in length than the rudimentary ones of female 5.
3. First antenna unusually large; the first segment of peduncle is dilated distally, while the second, which reaches beyond level of apex of pseudorostrum, is expanded proximally *Sheardia* gen. nov.
- First antenna small or moderate, with the proximal segments of peduncle not at all dilated, and the second not reaching to level of apex of pseudorostrum 4.

(1) No. 11, The Family Diastylidae (part i) see *Trans. Roy. Soc., S. Aust.*, lxi (2), 1945, pp. 173-211, fig. 1-26.

4. Female with exopods on first and second pairs of peraeopods only. First peraeopod with propodus not very large, at most barely more (usually much less) than half as long as basis
Gynodiastylis Calman.
 Female with exopods on first to fourth peraeopods. First peraeopod with propodus very large, at least little shorter than basis *Dicoides* gen. nov.
5. First antenna with third segment of peduncle distinctly longer than combined lengths of the dilated first and second segments. First peraeopod shorter than cephalothorax, its dactylus with no brush of very long setae. Pseudorostrum upturned in female and young male
Alloidiastylis Hale.
 First antenna normal, the third segment of peduncle much shorter than combined lengths of first two joints, which are not dilated. First peraeopod longer than cephalothorax, its dactylus with a brush of very long setae radiating from distal half. Pseudorostrum not upturned *Zimmeriana* gen. nov.

GENUS SHEARDIA nov.

Female. The first antennae are much as in *Alloidiastylis* (particularly *A. tenuipes* sp. nov.), and have the two proximal segments greatly expanded; the third joint, however, although much elongated is shorter in relation to the rest of peduncle. The whole appendage is more than half as long as the carapace.

While the prominently enlarged and projecting basal joints of the first antenna separate this from all other of the related genera except *Alloidiastylis*, it is distinguished from the last-named by the absence of long distal setae on the pseudorostrum (which is not upturned) and by the presence of well-developed exopods on the first and second peraeopods. The telson is very different; as a whole it is small, with preanal portion very short, and post-anal part rather long for the group and armed with a pair of unusually stout spines.

Genotype *Sheardia antennata* sp. nov.

Like *Gynodiastylis* but differing in the character of first antenna and telson. In species of *Gynodiastylis* having the telson proportionately as short, there is no post-anal part.

The genus is named after Mr. Keith Sheard, who is responsible for the securing of much of the material dealt with herein.

SHEARDIA ANTENNATA sp. nov.

Ovigerous female. Integument calcified, and chalky-opalescent in appearance; with fine reticulate patterning, particularly distinct on pedigerous somites.

Carapace less than one-third of total length of animal, considerably wider than deep and two-thirds as long again as deep; seen from above it is subtriangular in shape, broadest posteriorly and irregular laterally because of a dorso-lateral elongate tumidity on each side below frontal lobe and a distinct hollow below and to the rear of this elevation; the posterior two-thirds of the dorsum is depressed with the median portion and lateral edges of the hollow raised in the form of rounded folds; inside each rear corner of frontal lobe is a low boss. Antero-lateral margin almost straight, and antennal angle well defined, subacute and finely serrate, the tiny teeth continued along inferior margin. Pseudorostrum narrowly truncate in front, the lobes meeting for a distance equal to about one-fifth of length of carapace. Frontal lobe wide, distinctly defined; ocular lobe twice as broad as long, with three very ill-defined lenses.

Pedigerous somites together three-fourths as long as carapace. First not much shorter than second, which is shorter than any of posterior three and has the pleural parts forwardly produced; third and fourth fused together, the third forwardly produced laterally (where it overlaps second) and bent backwards so that second and third peraeopods are well separated; there is a pair of low dorso-lateral ridges on fourth but no other defined sculpture save the fine median line so often present.

Pleon robust, shorter than cephalothorax; fifth somite rather elongate, not much wider than deep and half as long again as sixth somite, which is widened distally, where it is slightly broader than long; telson two-thirds as long as sixth somite, cordate, with preanal portion very short but longer than the tapering post-anal part, which bears a pair of large distal spines flanked by a pair of bristles.

First two joints of peduncle of first antenna curiously articulated (fig. 2, ant. 1); first segment about as deep as long, the upper portion elevated anteriorly and furnished with a hooked spine, the front margin with a plumose seta; second segment much elevated above and at the rear, its summit higher than that of

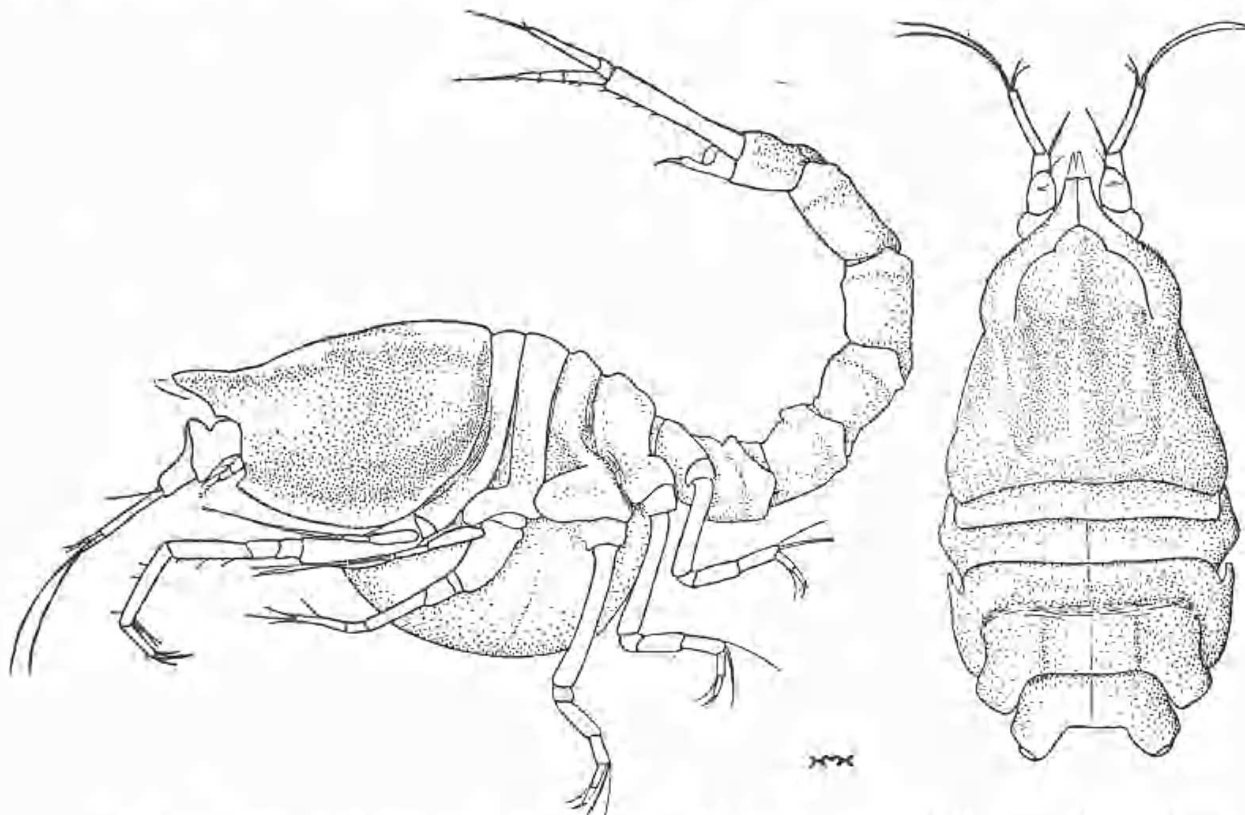


Fig. 1. *Sheardia antennata*, type female; lateral view and cephalothorax from above. ($\times 28$).

first; distal end of second with a strong spine-like seta; third peduncular joint about one-fourth as long again as second; flagellum three-jointed, less than one-fourth as long as third peduncular joint; accessory lash three-jointed, about three-fourths as long as main flagellum.

Second antenna three-jointed, the distal segment stout and with apical seta.

Mandible with ten spines in the row.

Basis of third maxilliped stout and short, as long as first four of the remaining joints together, serrate on outer margin and with long stout setae at external distal portion; carpus and propodus subequal in length, each about twice as long as dactylus.

First pereopod, when extended, with carpus reaching to level of end of pseudorostrum; basis half as long as rest of limb, without spines, serrate on outer edge; propodus very slightly longer than carpus and fully twice as long as dactylus, with two long setae and one short one at inner distal end; dactylus with one of the several terminal setae spine-like, and as long as the joint.

Second pereopod reaching forward almost to level of antennal angle; basis very short, only two-thirds as long as exopod and less than half as long as remaining joints combined; ischium distinct; carpus twice as long as merus and as long as propodus and dactylus together; dactylus twice as long as propodus.

Posterior pereopods with sparse setae. Third and fourth pairs about as long as second leg, with basis nearly as long as rest of limb; merus and carpus

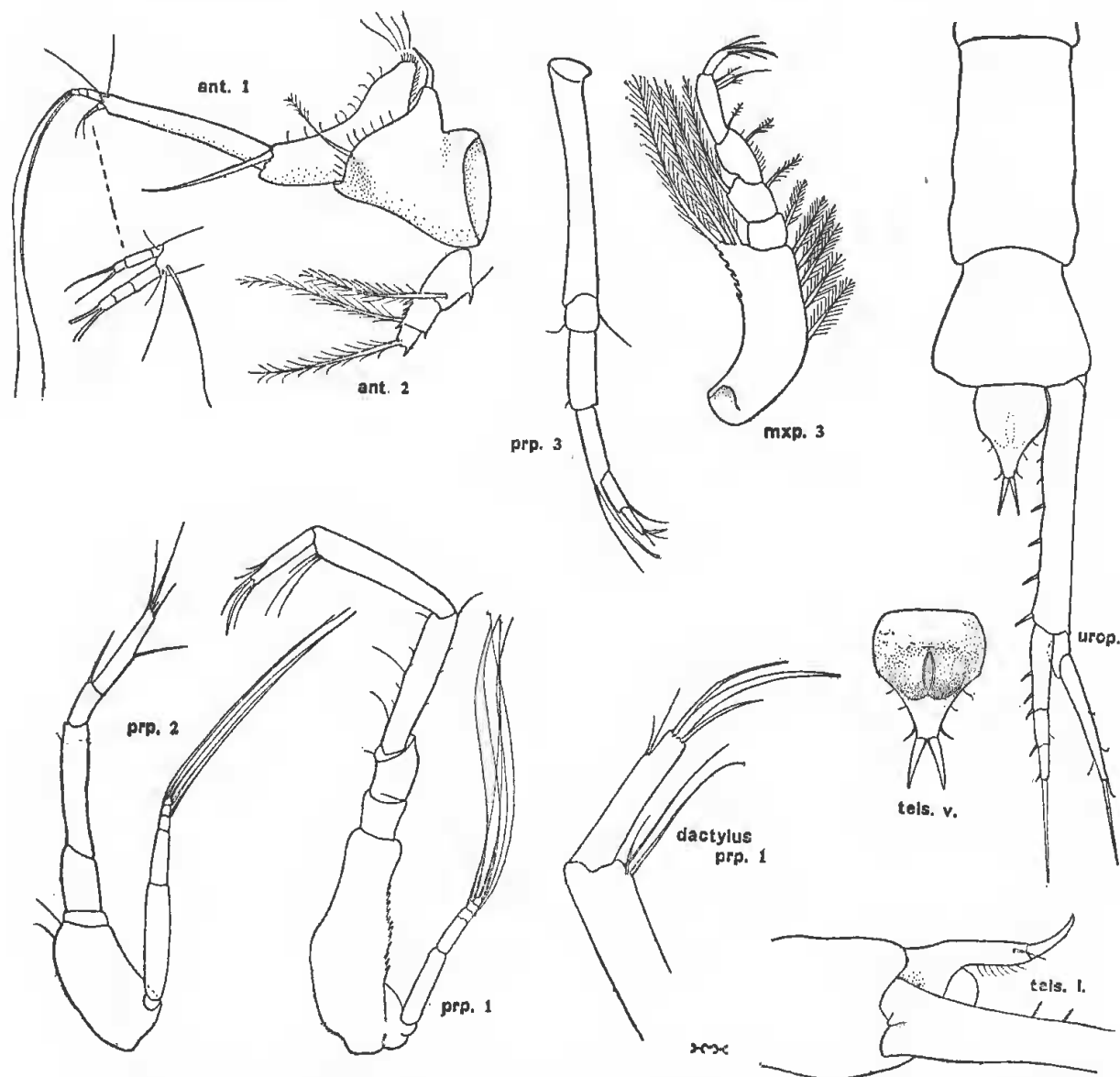


Fig. 2. *Sheardia antennata*, paratype ovigerous female; ant., first and second antennae ($\times 75$); mxp. and prp., third maxilliped and first to third pereopods ($\times 56$; dactylus of first pereopod, $\times 112$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 56$); tels. l. and v., lateral and ventral views of telson ($\times 75$).

subequal in length, each twice as long as propodus; carpus with two equal distal setae, one much stouter than the other, reaching to level of tip of dactylus. Fifth pereopod not much smaller than fourth but with basis shorter.

Peduncle of uropod with four strong spines on distal half of inner margin; it is two and three-fourths times as long as telson and fully half as long again as the rami, which are subequal in length, the exopod slightly the longer; first

joint of endopod with three inner spines, longer than combined lengths of second and third, which are subequal in length and have each one inner spine; terminal spine two-thirds as long as ramus, extending slightly beyond tip of exopodal spine.

Length 4.1 mm.

Loc. New South Wales; Ulladulla, Brush Island, 45 fath., in fine silt on flat-head grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2699.

Genus GYNODIASTYLIS Calman

Gynodiastylis Calman, 1911, pp. 312, 366; Stebbing, 1912, p. 146 and 1913, p. 161; Zimmer, 1914, p. 187 and 1930, p. 651.

This genus was instituted by Calman to include four species, in all of which the telson is plump, subconical, with no post-anal portion and without the pair of distinct terminal spines so generally characteristic of the family; in addition, the third maxilliped of the females has no exopod, while the males were unique in the family in that they lack all trace of the usual two pairs of pleopods. Three of Calman's species are rather robust in form and have the carapace carinate; the fourth—*laevis*—is smooth and elongate, with the second and fourth pedigerous somites dorsally unusually long. Zimmer (1914, pp. 187, 189, fig. 14-16) added two Australian species somewhat resembling *laevis* in form, which he designates the "*Diastylopsis-Habitus*." The present writer later added another carinate species which, like those of Zimmer, agrees with Calman's forms in having the telson unarmed, and also a smoother species with small telsonic spines.

A score of further species—all but one new—are now referred to the genus. All the females agree in lacking an exopod on the third maxilliped, while the males, where available, have no pleopods, but a great deal of latitude is allowed for the telson; this may have part of its length, as much as fully one-third of it, post-anal, and may have a pair of terminal spines, and in some cases a pair of lateral spines also. Its lateral margins may be more or less distinctly serrate, or may be incised to form one or more pairs of teeth, a feature found elsewhere in the Diastylidae. It would appear, indeed, that the species previously included in the genus happen to be some of those in which the reduction of post-anal part and armature are carried to the greatest extreme, and that many of them do not depart so drastically from the key character of the family.

As the first of the forms with telson armed and with post-anal portion came to hand it was thought that they represented a genus easily separable from *Gynodiastylis* by this character. With more material, however, it became apparent that intermediate stages occur, and that as far as the spines alone are concerned there may be some little difference between the sexes (*truncatifrons* Hale). Furthermore, obviously related forms of "*Diastylopsis-Habitus*" such as *attenuata* sp. nov. and *ambigua* sp. nov. have in the one case the telson unarmed and without post-anal part, in the other a telson with a small portion of its length post-anal, armed with distinct terminal and lateral spines and with the sides serrate. Exactly the same difference may apply to "carinate" forms, for instance *lata* sp. nov. and *ampla* sp. nov. The telson, then, is of little assistance in the grouping of the species. Turning to other characters the first pereopod proves of some interest and in the key given below the species are divided into two groups by the character and length of the setae of the propodus and the relative length of that joint. In Calman's species these differences are found between *laevis* and his other three forms. It will be noted that in both sections there occur similar differences in the telson and similar variations of the "*Diastylopsis-Habitus*."

Several species in the collections now under consideration are represented only by specimens lacking part of the front legs. Three of these are described and so, necessarily, are placed in both sections of the key, where they are marked with an asterisk; *rochfordi* sp. nov. almost certainly belongs in the first group.

The inclusion in *Gynodiastylis* of species with telson armed and with post-anal part renders more difficult concise diagnosis to assist separation of females of this genus from those of *Paradiastylis*; the male of the last-named of course is readily recognized by the long flagellum of the second antennae and the development of pleopods. There are, however, quite marked differences in the peraeopods; apart from those already referred to (Hale, 1945, p. 173) there are, for instance, the thickened and shortened distal carpal seta of the stout third to fifth legs, referred to in the descriptions, which is usually found in *Gynodiastylis*, but apparently not in the few species belonging to *Paradiastylis*. The uropods in the latter have the peduncle long and slender, whereas in *Gynodiastylis* it is wider. Incidentally, the fact that less than three segments are apparent in the endopod of this appendage in some species of *Gynodiastylis* is important only as a specific character, and the number of joints may differ in the sexes.

Dic (Stebbing 1910, p. 415) has the first peraeopods of the same type as in *Gynodiastylis*, although the propodus is relatively longer than in those species with elongate carpus, and the cylindrical telson is much longer than in any of the species included in *Gynodiastylis*. While these characters are perhaps not of great importance I think that *Gynodiastylis* should remain separated from *Dic* because of the difference in the third maxilliped, even if this appendage proves to lack the exopod in the female of Stebbing's genus. The same holds for *Zimmeriana* gen. nov. whatever the condition of thoracic exopods may be in the female of *Dic* (see Zimmer, 1914, pp. 192-193).

As previously noted, the armament of the male telson does not differ markedly from that of the female. In the male the flagellum of the second antenna is short (as a rule not much longer than peduncle), stout, and furnished with dense sensory setae, while exopods are present on the first four pairs of legs, the first three, or on first and second only. The first antenna, as in the other available adult males of the group, differs little from that of the females and is not furnished with the dense brush of sensory setae occurring in some other Diastylid genera; incidentally, Calman (1912, p. 669) suggests that such setae are situated on the enlarged proximal segment of the outer flagellum rather than on a separated area of the third peduncular joint.

KEY TO SPECIES OF *GYNODIASTYLIS*.

1. Propodus of first peraeopod with eight to twelve setae, subequal in length and at least almost twice as long as combined lengths of propodus and dactylus; carpus of same limb elongate, almost twice as long as propodus, or more 2.
Propodus of first peraeopod with one to four unequal setae, the longest at most little more than combined lengths of propodus and dactylus; carpus of same limb usually not differing greatly in length from propodus, at most barely more than half as long again as it .. 17.
2. Carapace sculptured, with at least five ridges on each side 3.
Carapace smooth, or with at most three ridges on each side 7.
3. Endopod of uropod unisegmentate in both sexes *carinata* Calman.
Endopod of uropod bi- or trisegmentate 4.
4. Telson with one-fourth of its length post-anal and armed with a pair of distinct terminal spines. Endopod of uropod trisegmentate in male **rochfordi* sp. nov.
Telson with no definite post-anal portion, unarmed or with rudimentary terminal spines. Endopod of uropod bisegmentate in both sexes 5.
5. First segment of endopod of uropod much shorter than second *lata* sp. nov.
Segments of endopod of uropod subequal in length 6.

6. Exopod of uropod not much shorter than endopod. Sixth pleon somite but little broader than long *costata* Calman.
 Exopod of uropod only three-fifths as long as endopod. Sixth pleon somite half as wide again as long *turgida* Hale.
7. Carapace with surface irregular, with a pair of dorso-lateral ridges or folds, and with a large shallow depression on sides 8.
 Carapace with surface smooth or almost so, with no dorso-lateral ridges, and no large depression on sides 12.
8. Lower part of sides of carapace without longitudinal ridge or fold *bicristata* Calman.
 Lower part of sides of carapace with a longitudinal ridge or fold 9.
9. Rami of uropod as long, or almost as long, as peduncle 10.
 Rami of uropod short, at most less than two-thirds as long as peduncle 11.
10. Inner margins of peduncle and trisegmentate endopod of uropod with many short spines (13 + 19). Female only **robusta* sp. nov.
 Inner margins of peduncle and bisegmentate endopod of uropod with few spines (2 to 3 + 6 to 8). Males only *dilatata* sp. nov.
11. Telson with only an insignificant post-anal portion. Carapace with folds but no sharply defined ridges, and with branchial regions swollen. Peduncle of uropod more than twice as long as endopod **strumosa* sp. nov.
 Telson with almost one-third of its length post-anal. Carapace with distinct carinae but with branchial regions not swollen. Peduncle of uropod much less than twice as long as endopod *ampla* sp. nov.
12. Telson with one-third of its length post-anal *subtilis* sp. nov.
 Telson with at most an insignificant post-anal portion 13.
13. Each pseudorostral lobe with a sharp dorsal carina, extending from front to ocular lobe *carinirostris* sp. nov.
 Pseudorostral lobes not carinate 14.
14. Antero-lateral angle of carapace denticulate. Telson with distinct spines at distal end .. 15.
 Antero-lateral angle of carapace not denticulate. Telson unarmed 16.
15. Carapace with anterior half of inferior margin serrate. Second peraeopod with ischium suppressed, and with carpus twice as long as propodus and dactylus together. Dactylus of second to fifth peraeopods about three times as long as propodus *truncatifrons* Hale.
 Carapace with inferior margin not serrate except at antero-lateral angle. Second peraeopod with ischium distinct, and with carpus not longer than propodus and dactylus together. Dactylus of second to fifth peraeopods barely or not longer than propodus *polita* sp. nov.
16. Endopod of uropod trisegmentate in female *hartmeyeri* Zimmer.
 Endopod of uropod bisegmentate in female (unisegmentate in male) *similis* Zimmer.
17. Carapace smooth 18.
 Carapace with spines, tubercles, ridges or tumidities 20.
18. Telson with lateral margins serrate, and with a pair of terminal spines, each flanked by a lateral spine *ambigua* sp. nov.
 Telson unarmed, and with lateral margins entire 19.
19. Endopod of uropod unisegmentate. Male with exopods on first and second peraeopods only *laevis* Calman.
 Endopod of uropod bisegmentate. Male with exopods on first, second and third peraeopods *attenuata* sp. nov.
20. Sides of carapace closely beset with spines *echinata* sp. nov.
 Sides of carapace not spiny 21.
21. Sides of carapace studded with small glassy tubercles *roscida* sp. nov.
 Sides of carapace without such tubercles 22.
22. Each side of carapace with a well-defined ridge, curving up from neighbourhood of antennal angle to meet a dorso-lateral ridge 23.
 Carapace without this transverse ridge 24.
23. Telson with at least one pair of lateral teeth and, in adult, with apex pointed and projecting for a short distance beyond bases of a pair of subterminal spines. Endopod of uropod unisegmentate in both sexes *mutabilis* sp. nov.
 Telson with lateral margins entire, its narrowly subtruncate apex with a pair of small spines. Endopod of uropod bisegmentate in both sexes *ornata* sp. nov.
24. Rami of uropod unusually short, less than half as long as the peduncle 25.
 Rami of uropod usually almost as long as peduncle and always much more than half as long as it 26.

25. Telson with an insignificant post-anal portion, armed with a pair of terminal spines flanked by a pair of short lateral spines. Endopod of uropod trisegmentate (female) **strumosa* sp. nov.
 Telson with slightly longer post-anal portion, armed with a pair of terminal spines, flanked on each side by a long bristle. Endopod of uropod bisegmentate in both sexes *margarita* sp. nov.
26. Lower part of sides of carapace with four longitudinal ridges . . . **rochfordi* sp. nov.
 Lower part of sides of carapace with at most one longitudinal ridge . . . 27.
27. Carapace with two pairs of longitudinal ridges on posterior half of dorsum. Telson unarmed *quadricristata* sp. nov.
 Carapace with one pair of longitudinal ridges on back. Telson armed with at least a pair of terminal spines . . . 28.
28. Carapace almost smooth and without distinct excavation on the sides, which, as seen from above are evenly curved. Each lateral margin of telson incised to form a large tooth *brevipes* sp. nov.
 Carapace with large lateral depressions, so that the sides, as seen from above, are not evenly curved. Lateral margins of telson smooth or finely serrate, with no large teeth . . . 29.
29. Second pereopod with basis longer than the abbreviated remainder of limb *concava* sp. nov.
 Second pereopod with basis shorter than rest of limb . . . 30.
30. Dorso-lateral carinae of carapace with prominent lateral projections in adult. Telson with a bristle on each side near terminal spines. Carpus of second pereopod not as long as propodus and dactylus together *tumida* (Hale).
 Dorso-lateral carina of carapace without projections. Telson with a short spine on each side of terminal spines. Carpus of second pereopod longer than propodus and dactylus together **robusta* sp. nov.

GYNODIASTYLIS ROCHFORDI sp. nov.

Subadult male. Integument rather strongly calcified and brittle.

Carapace a little less than two-fifths of total length of animal and twice as long as the pedigerous somites together; it is depressed, fully twice as long as deep, and is marked with clear cut longitudinal carinae; a pair of these are dorso-lateral,

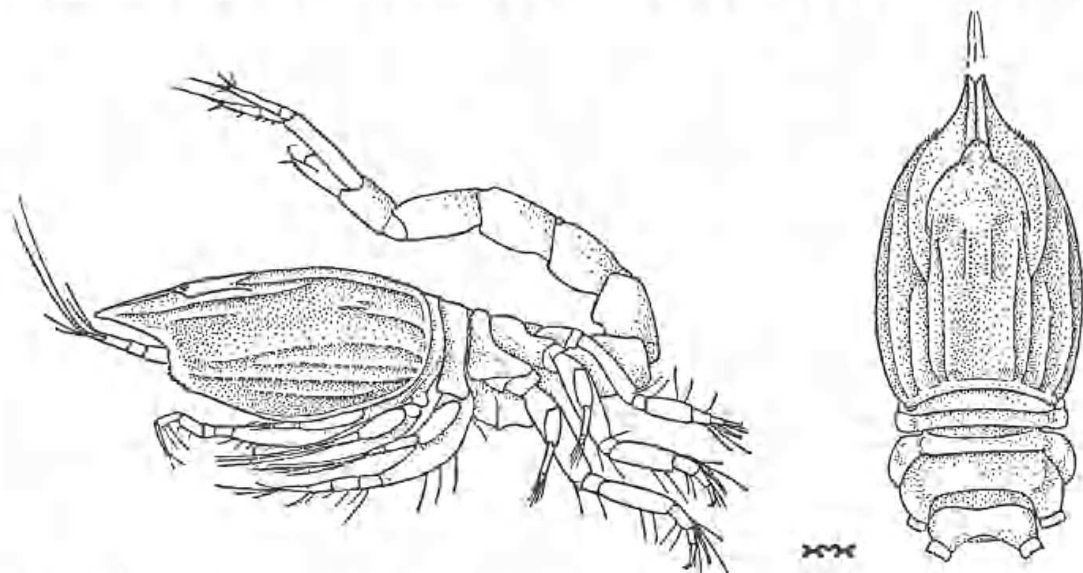


Fig. 3. *Gynodiastylis rochfordi*, type subadult male; lateral view and cephalothorax from above ($\times 25$).

arising on sides of pseudorostrum, curving around outside of frontal lobe and each meeting a ridge running from just inside end of suture of frontal lobe and extending to hind margin; inside these is a pair of dorsal ridges on posterior half, with a pit alongside their hinder ends, and inside these again a pair of shorter ridges at

middle of length of carapace; there is a short ridge on each pseudorostral lobe, extending from apex to ocular lobe; the sides have several short carinae and, in lower half, four longer ones, the uppermost of which margins an elongate lateral depression. Antero-lateral margin not excavate below pseudorostrum; antero-lateral angle rounded and finely serrate. Pseudorostrum prominent, the lobes gaping slightly at apex; subacute in front as seen from the side, and meeting for a distance equal to nearly one-fourth of length of carapace. Frontal lobe well-defined; ocular lobe subtriangular, little wider than long, with three small pale corneal lenses.

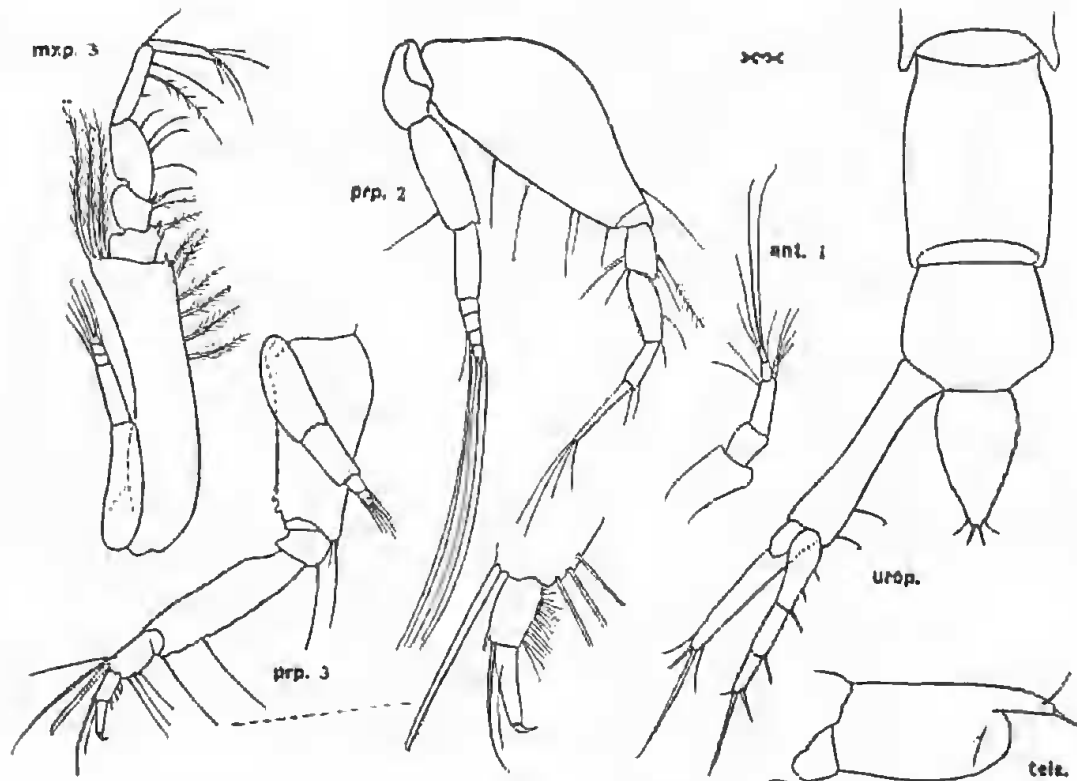


Fig. 4. *Gynodiastylis rockfordi*, type subadult male; ant., first antenna ($\times 56$); mxp. and prp., third maxilliped, and second and third peraeopods ($\times 56$); propodus and dactylus of third leg, $\times 120$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 56$); tels., lateral view of telson ($\times 80$).

First three pedigerous somites dorsally short, each shorter than fifth, which is not as long as fourth; the pleural parts of third are well produced backwards, so that second and third legs, particularly for a not fully adult male, are quite markedly separated.

Pleon fully as long as cephalothorax; fifth somite quite half as long again as sixth, which is only slightly expanded posteriorly and is not much wider than long; telson as long as sixth somite, subcordate, with lateral margins feebly serrate and with a pair of slender terminal spines, just anterior to which is an upstanding bristle on each side; one-fourth of total length of telson is post-anal.

First joint of first antenna about as long as rest of peduncle; second segment three-fourths as long as third; flagellum two-jointed, not as long as second peduncular joint, and accessory lash three-jointed, fully half the length of main flagellum.

Third maxilliped as long as the remaining joints together; carpus, propodus

and dactylus long, each about equal to combined lengths of ischium and merus, which bear inner distal teeth.

Distal joints of first peraeopod missing.

Second peraeopod with exopod longer than basis, which is stout and very little longer than rest of limb; ischium marked off by a suture but not distinctly articulated; merus (which has a small outer tooth near distal end) as long as propodus, and fully two-thirds as long as carpus; the last-named is as long as the dactylus, which bears slender distal setae, the longest exceeding the joint in length.

Third and fourth peraeopods with exopods, moderately well-developed but as usual a little smaller than those of first and second legs; merus not much shorter than basis and twice as long as carpus and propodus together; carpus with the last of the distal setae stouter than the others and reaching to tip of dactylus; penultimate outer carpal seta, like the slender propodal seta, reaching well beyond level of tip of dactylus, which is about as long as propodus, and has a very short claw-like terminal portion distinctly separated. Fifth peraeopod a little shorter than fourth, with basis as usual more slender.

Peduncle of uropod half as long again as telson, with two bristles near distal end of inner margin; endopod a little longer than exopod and not much shorter than peduncle; it is three-segmentate, the first joint somewhat shorter than rest of ramus, and with two short spines and one longer spine on inner margin; second joint distinctly longer than third and like it with a single inner spine at distal end; terminal spine of endopod half as long as the ramus and shorter than the longer of the two very unequal terminal spines of exopod.

Colour cream. Length 4 mm.

Loc. New South Wales; Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2695.

This species is named after Mr. D. Rochford, Hydrologist, C.S.I.R., Division of Fisheries.

GYNODIASTYLIS lata sp. nov.

Ovigerous female. Carapace fully one-third of total length of animal and more than half as long again as pedigerous somites together; it is half as long again as deep, and seen from above is subtriangular in shape, broadest at hinder end, where it is as wide as long; back and sides with numerous longitudinal carinae; the dorso-lateral ridges are restricted to posterior half, and anterior to them on each side is a large, shallow depression; between the dorsal ridges there are faint eroded pits. Antero-lateral margin excavated to form a large antennal notch; antero-lateral angle produced, acute. Pseudorostral lobes meeting in front of ocular lobe for a distance equal to nearly one-fifth length of carapace, anteriorly gaping slightly for a very short distance; each lobe is pointed in front, both as seen from above and from the side, and on its dorsum has a ridge-like longitudinal fold in front of ocular lobe; sutures fused, so that eye lobe is not well defined. No distinct lenses, but a pair of raised smooth oval areas at front of ocular lobe.

First to third pedigerous somites successively increasing in length dorsally, and as wide as is carapace across hinder end; pleural parts of third and fourth considerably expanded laterally; dorsum of second and third with a pair of obsolete elevations, that of fourth with a pair of longitudinal ridges.

Pleon six-sevenths as long as cephalothorax; fifth somite fully half as long again as sixth, which is broad, half as wide again as long; telson subtriangular in shape as seen from above, and not much shorter than sixth somite; its sides are slightly rounded, and no apical spines are discernible.

First antenna with second joint of peduncle half as long as first and two-

thirds as long as third; accessory flagellum two-thirds as long as main flagellum, which is four-jointed.

Third maxilliped with basis wide, shorter than rest of limb and slightly expanded distally, but not at all forwardly produced; carpus and propodus subequal in length, each a little longer than dactylus, which has one of its distal setae stout and as long as the joint itself.

First pereopod short, the carpus reaching to level of apex of pseudorostrum; basis half the combined lengths of remaining joints; carpus about as long as basis,

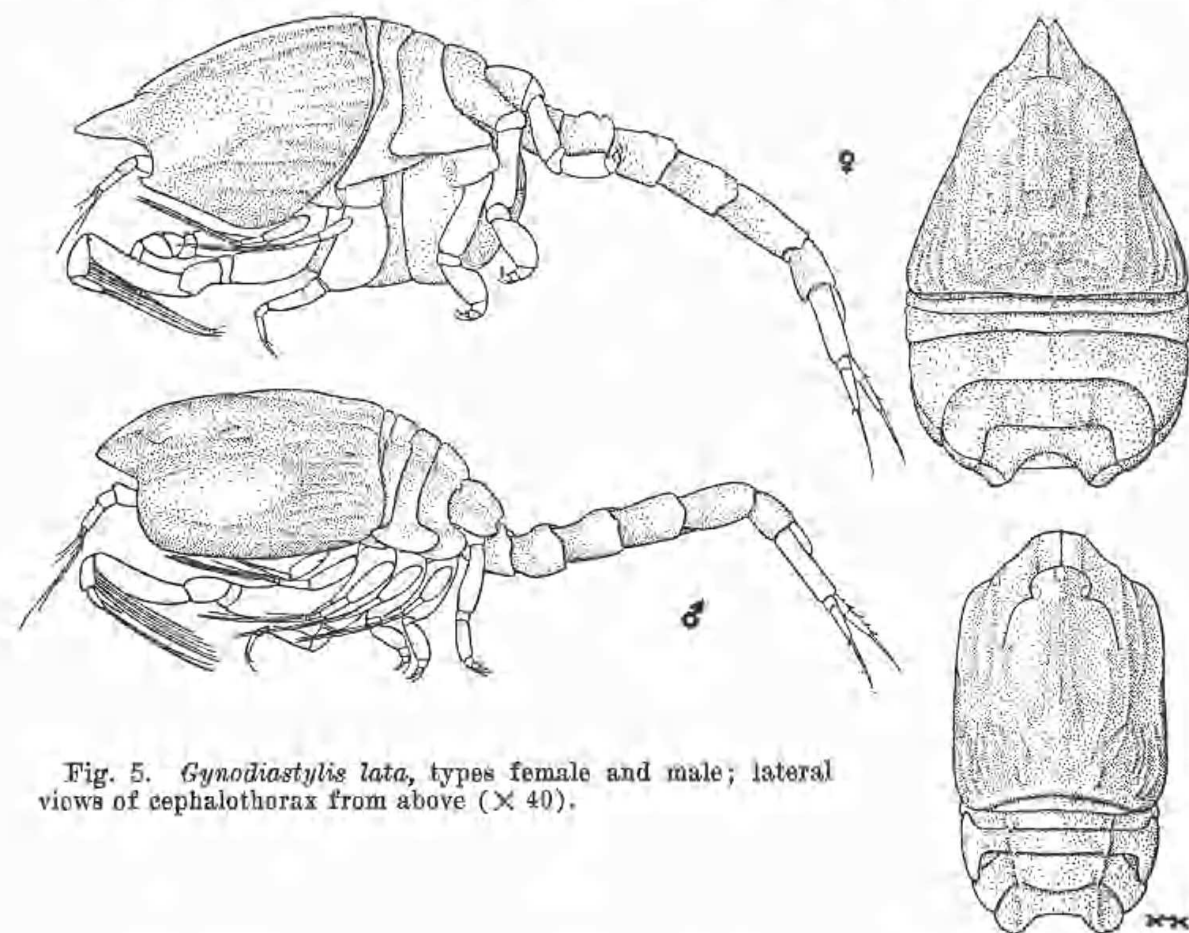


Fig. 5. *Gynodiastylis lata*, types female and male; lateral views of cephalothorax from above ($\times 40$).

more than twice as long as propodus and four times as long as dactylus; like the ischium and merus it bears a few short inner setae; propodus dilated in distal half, the expanded portion bearing a fringe of very long setae; dactylus with similar distal setae; exopod as long as basis.

Second pereopod with exopod as long as basis, which is broad (width more than half length) and as long as rest of limb; ischium very short, collar-like; carpus half as long again as merus and longer than propodus and dactylus together; propodus fully three-fourths as long as dactylus, which bears a curved distal claw and thinner setae.

Third and fourth pereopods robust, not much shorter than second; merus broad, more than twice as long as the short carpus and propodus together; dactylus curved, claw-like. Fifth pereopod scarcely smaller than fourth.

Peduncle of uropod not quite twice as long as telson, with one subdistal spine on inner margin; endopod three-fifths as long as peduncle, and nearly one-third as long again as exopod; two-jointed, the proximal segment about two-thirds as

long as second, with a short inner spine at distal end; second joint with two inner spines and with terminal spine rather slender, longer than the ramus; exopod with terminal spine longer than the ramus, but shorter than that of endopod.

Colour cream. Length 2.2 mm.

Adult male. Carapace more than one-third of total length of animal, nearly twice as long as pedigerous somites together and three-fourths as long again as

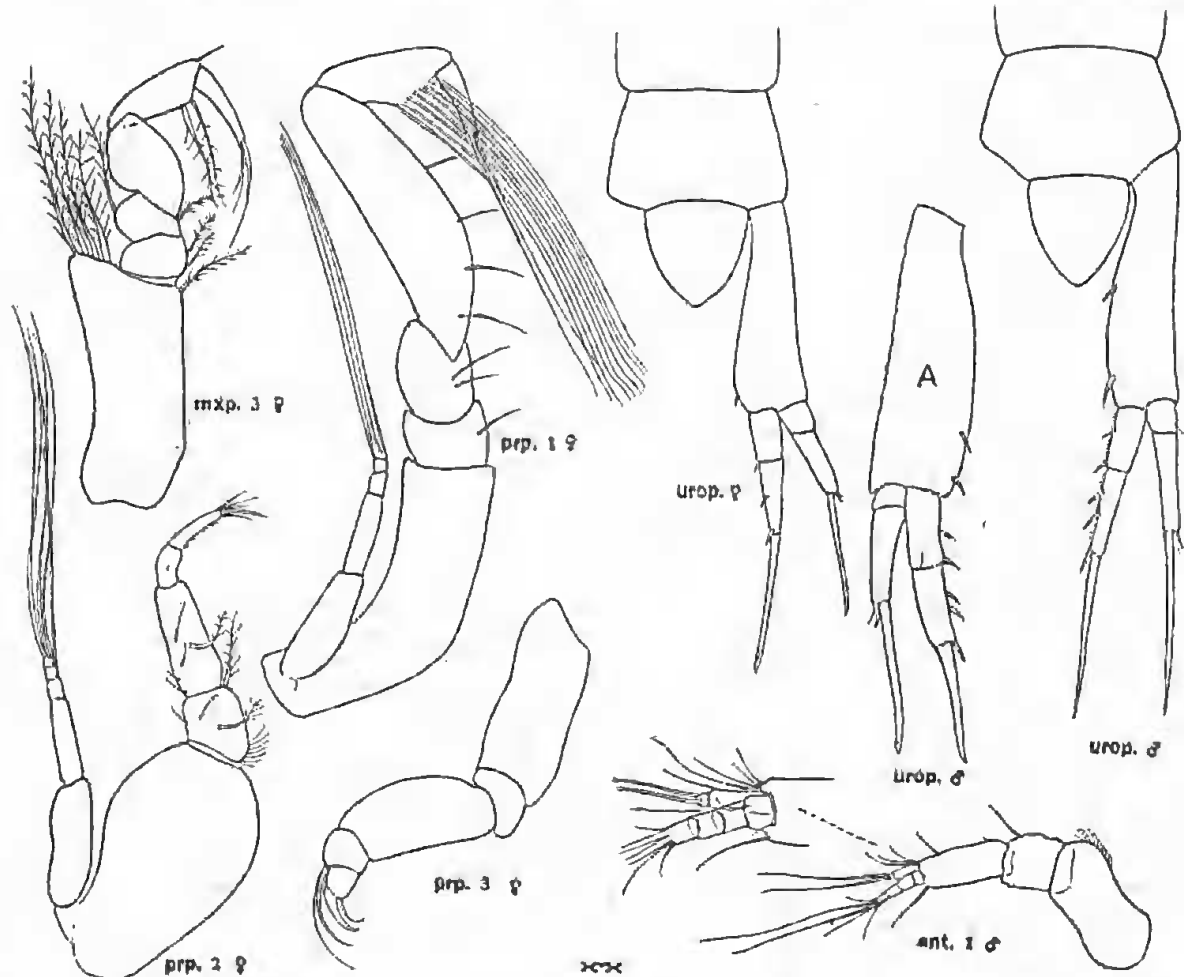


Fig. 6. *Gynodiastylis lata*, type female and paratype male; ant., first antenna ($\times 125$; flagella, $\times 250$); mxp. and prp., third maxilliped and first to third peraeopods ($\times 125$); urop., uropod with sixth pleon somite and telson ($\times 125$). A. urop., Uropod of male of *G. turgida* for comparison ($\times 125$).

its depth, which is equal to about four-fifths its greatest breadth; seen from above it is subrectangular; disposition of ridges much as in female. Antero-lateral margin and "angle" rounded, without trace of tooth. Pseudorostral lobes stouter and shorter than in female, subtruncate in front as viewed from above. Ocular lobe twice as wide as long, with three oval pale areas, apical and lateral, apparently representing the eyes.

Pedigerous somites successively increasing in dorsal length; first somite exposed only dorsally and dorso-laterally; second overlapped by pleural part of third, which also overlaps fourth to the rear; fourth and fifth with pleural parts expanded backwards; second to fifth each with a dorso-lateral ridge on each side.

Pleon much as in female, with distal somites of same proportions.

Well developed exopods (with peduncle not very wide, however) on third maxilliped and first to fourth peraeopods.

Peduncle of uropod more than twice as long as telson, with two small spines on inner margin; endopod three-fifths as long as peduncle, but only about one-sixth as long again as endopod, with proximal joint three-fourths as long as second and with two inner spines; second joint with three inner spines and with terminal spine longer than ramus; terminal spine of exopod fully as long as that of endopod.

Length 2 mm.

Loc. Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, Stations 28 [type loc.], 29, 32, 42, 44, 46, 54 and 55, 40 cm. 60 m. net, 2.30 a.m., 3.30 a.m., 6.30 a.m., 7.00 p.m., 9.30 p.m. and 11.30 p.m. on Nov. 29, 1940; 9.10 p.m. and 9.40 p.m. on Dec. 6, 1940). Types in South Australian Museum, Reg. No. C. 2638-2639.

This species is by no means abundant in the material secured by Mr. Munro, but one or more males at least were taken at each of the townet stations mentioned above, covering afternoon and night. It and *turgida* Hale (1928, p. 42, fig. 11-12 and 1936, p. 420, fig. 10-11) are related to *costata* Calman (1911, p. 372, pl. xxxvi, fig. 1-10), but both differ in the more robust form, the relatively much shorter and broader sixth pleon somite, the shorter first peraeopods and the different proportions of the uropods. In *costata* the sixth pleon somite is "a little broader than long" in both sexes, while the uropod has the rami subequal in length and the first joint of the endopod little shorter than the distal. Both *turgida* and *lata* have the sixth pleon somite half as wide again as long and the rami of the uropod unequal in length. In the uropod of *turgida* the endopod has the joints subequal in length and the stout terminal spine shorter than the ramus (see fig. 6, A), but the exopod is not quite three-fourths the length of the endopod. *G. lata*, as described above, has the exopod of the uropod more as in *costata*, and relatively longer than in *turgida*, but the first joint of the endopod is much shorter than the distal, and the terminal spine of the endopod is longer than the ramus in both sexes.

The most noteworthy of other differences is that the male of *lata* has the antero-lateral margin of the carapace widely rounded and not produced to form an antennal tooth.

GYNODIASTYLIS ROBUSTA sp. nov.

Ovigerous female. Integument well calcified and brittle, with distinct reticulate patterning, and finely and closely granulate.

Carapace robust but relatively short, not much more than one-fourth of total length; it is broadest across the branchial regions, where it is wider than deep and almost as wide as long; on each side below the frontal lobe is a small keeled dorso-lateral tumidity, most apparent in dorsal view when it forms a bulge in the lateral outline; below and posterior to this the sides are shallowly concave and on the lower part a sharp horizontal ridge runs from the neighbourhood of antennal angle to hinder margin; on the back a ridge extends forwards on each side from near posterior margin to join the short carina on the aforementioned dorso-lateral tumidity, cutting across the rear corner of the frontal lobe; from about middle of length of each of the dorsal ridges a short and faint transverse carina runs in towards mid-line; there are two pairs of tubercles behind ocular lobe and a pair of large pits on the back near the swollen hinder margin. Antero-lateral margin very shallowly concave; antero-lateral angle obtusely angular and margin posterior to it finely serrate. Pseudorostrum narrowly truncate and excavate in front; lobes meeting for a distance equal to one-sixth of length of carapace. Frontal lobe well defined, very wide; ocular lobe rounded, twice as broad as long, with three lenses, unpigmented as usual in genus.

First two pedigerous somites short dorsally, but pleural parts of second produced well forwards, almost completely overlapping first; third somite expanded

fore and aft, the second and third legs well separated; fourth somite completely ankylosed with third and with a pair of widely separated longitudinal carinae on the back; the dorso-lateral parts of this somite, like the posterior portions of the sides of the carapace, are marked with numerous very short and inconspicuous horizontal ridges.

Pleon stout, longer than cephalothorax; fifth somite slightly depressed, more than half as long again as sixth, which is a little widened posteriorly, where it is barely broader than long; telson about as long as sixth somite, elongate cordate,

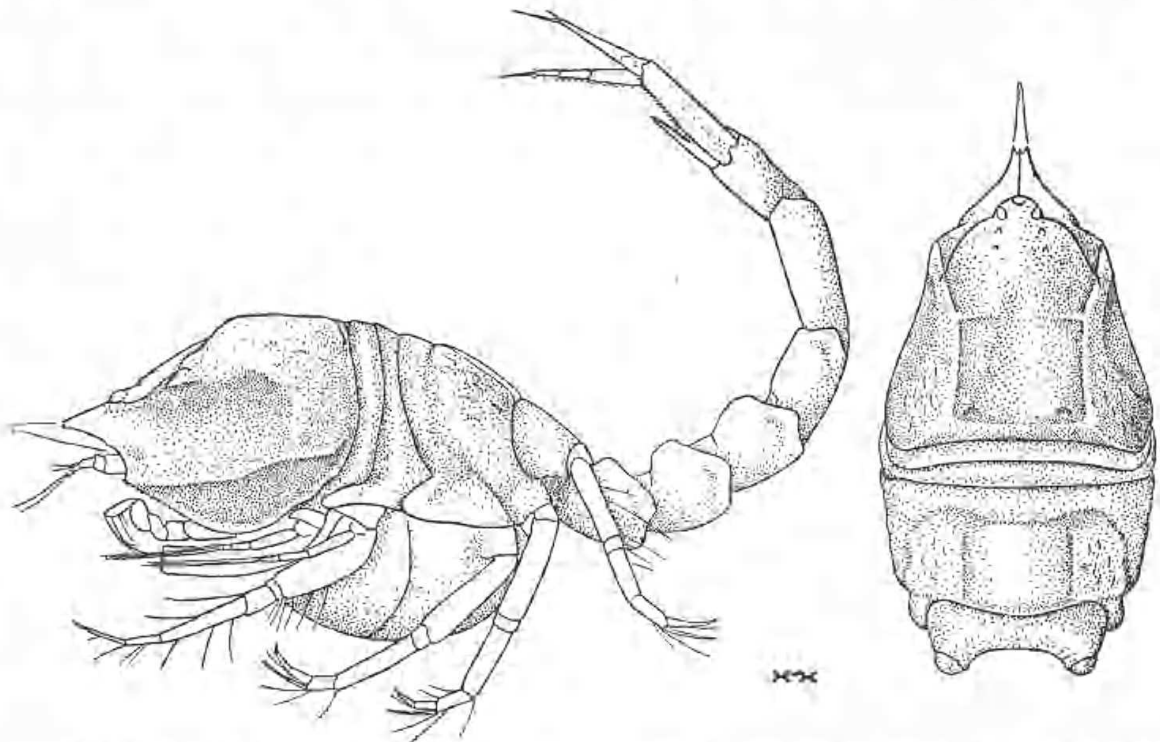


Fig. 7. *Gynodiastylis robusta*, type female; lateral view and cephalothorax from above ($\times 28$).

laterally serrate, and with post-anal part half as long as proximal; apex with a pair of short spines, flanked by a spine on each side.

First antenna relatively rather small (drawn to a larger scale than other appendages in fig. 8); first joint of peduncle stout, but more than twice as long as wide, half as long again as second and third segments together; third narrower than, and three-fourths as long again as, second; flagellum as long as last peduncular joint and with two equal joints; accessory lash three-jointed, less than half length of main flagellum.

Third maxilliped not elongate; basis as long as remaining joints combined, and with the setae at outer distal portion unusually short; basis, ischium and merus with an inner distal tooth; carpus, propodus and dactylus subequal in length.

Distal joints of first peraeopod missing.

Second peraeopod large, slightly longer than third, and reaching just beyond antennal angle when extended forwards; basis about as long as exopod and more than half the length of rest of limb; ischium distinct and quite large; the three distal joints are elongate; carpus two and one-half times as long as merus and fully twice as long as propodus, which is as equal in length to dactylus.

Third and fourth peraeopods differing little in length; they are robust with basis much shorter than rest of limb, and merus as long, or almost as long, as the

three distal joints together; carpus little longer than propodus, with the distal setae (one of which is very stout) subequal in length and not quite reaching to tip of the elongate dactylus.

Uropod with peduncle nearly half as long again as telson, not much longer than the subequal rami, and with a row of short, closely set spines (thirteen in number) on distal two-thirds of inner margin; endopod three-jointed, also with

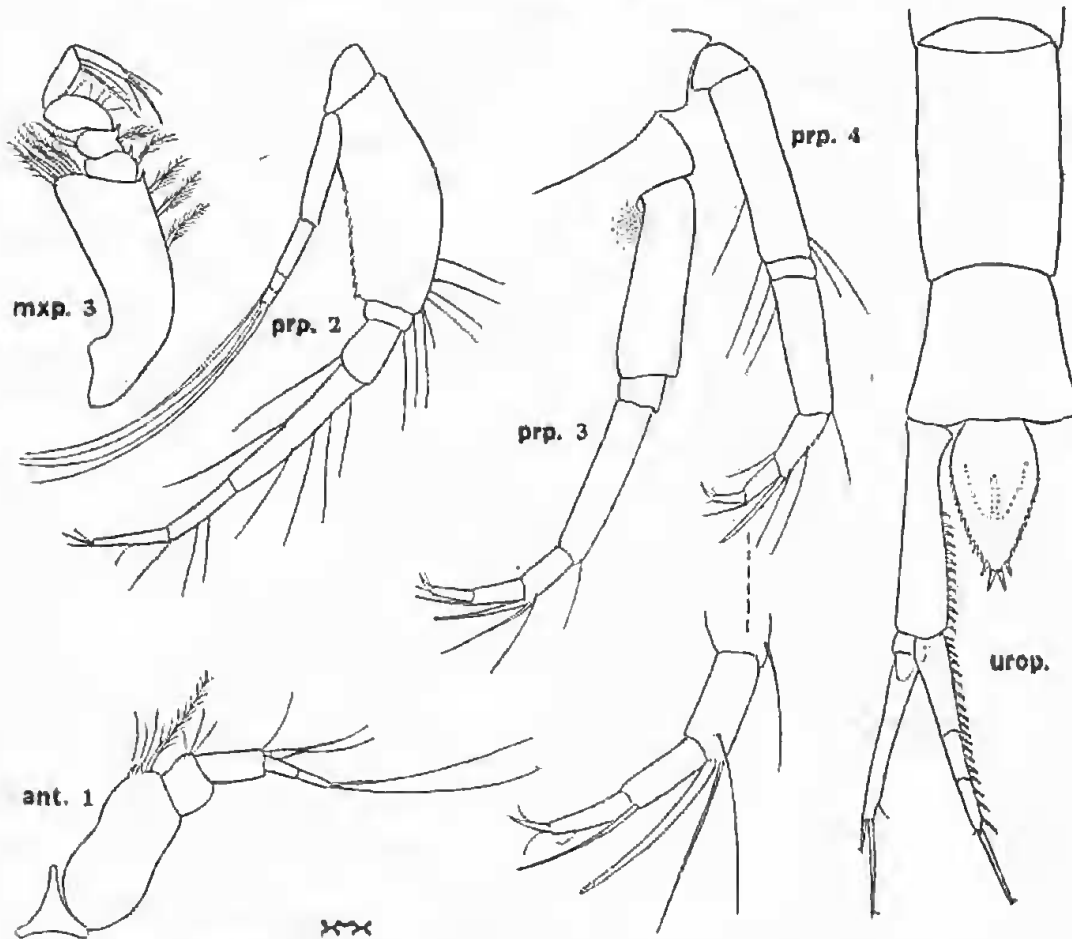


Fig. 8. *Gynodiastylis robusta*, paratype ovigerous female; ant., first antenna and upper lip ($\times 95$); mxp. and prp., third maxilliped and second to fourth peraeopods ($\times 50$; distal joints of fourth leg, $\times 95$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 50$).

inner spines numerous, there being eleven, five and three on the respective segments; first joint as long as combined lengths of subequal second and third; terminal spine less than half length of ramus and not quite as long as longer of the very unequal distal spines of exopod.

Colour white. Length 4.4 mm.

Loc. Tasmania: off Babel Island, 0-50 metres ("Warreen" Station 29, Jan., 1939). Type in South Australian Museum, Reg. No. C. 2724.

It is unfortunate that the terminal joints of the first peraeopods are missing in the two available females, for the species comes close to the males described under *dilatata*. The uropod of the female recorded above, however, is much more richly armed than is that of *dilatata*, while the peduncle of that appendage is a little longer than the endopod instead of shorter than it, the sculpture of the carapace is somewhat different, the size is considerably larger, etc. The difference in number of segments in the endopod could be sexual.

G. robusta may prove to bear the same relationship to *dilatata* as does *Dimorphostylis subaculeata* to its var. *praecox* (Hale, 1945, pp. 183, 185, fig. 7-9)

GYNODIASTYLIS DILATATA sp. nov.

Adult male. Integument lightly calcified, brittle, and with reticulate patterning of carapace distinct, the fine surface sculpture becoming imbricate on the pleon.

Carapace a little less than one-third of total length of animal and twice as long as pedigerous somites together; it is much depressed, being almost half as wide again as deep and is two-thirds as long again as deep; there is a sharp, curved dorso-lateral ridge on each side, partly encircling the front lobe and meeting a longitudinal carina which runs from hinder corner of frontal lobe to posterior margin of carapace; on the frontal lobe and for some distance posterior to it the dorsum is medianly ridged, but towards the rear end it is sulcate between the slightly tumid branchial regions; there is a short dorsal ridge on each pseudorostral lobe, extending from apex to ocular lobe; on the side is an extensive shallow hollow, margined below by a sharply elevated carina extending from antennal angle to

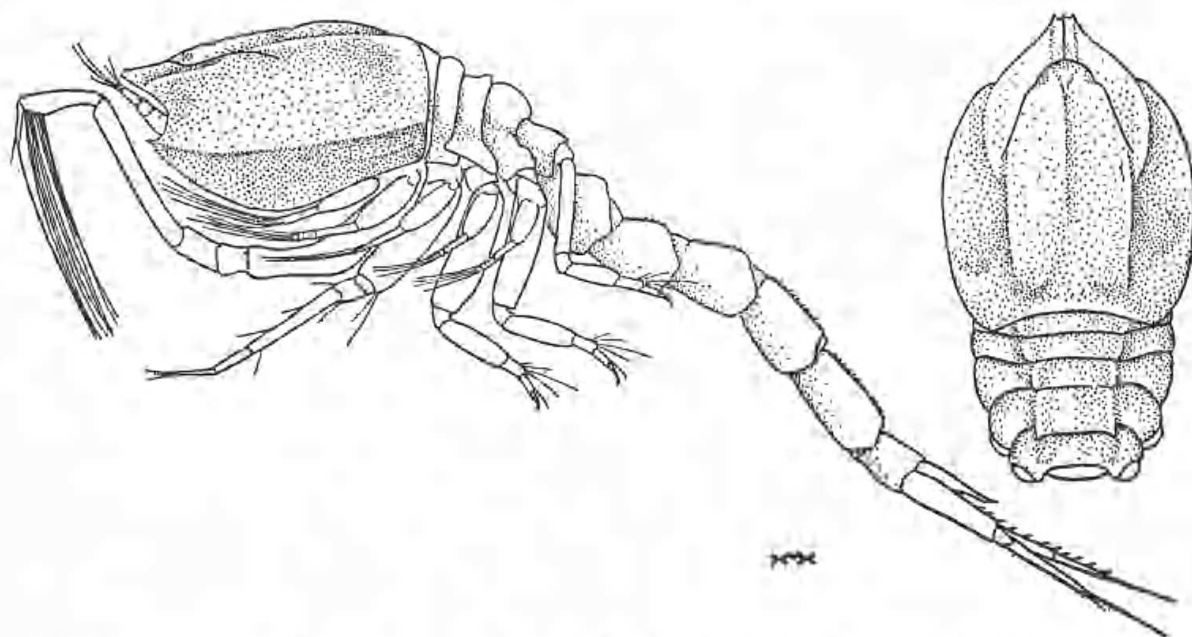


Fig. 9. *Gynodiastylis dilatata*, type male; lateral view and cephalothorax from above ($\times 35$).

posterior margin. Antero-lateral margin very shallowly concave; antennal angle acute and margin posterior to it very finely serrate. Pseudorostral lobes subtruncate in front and shallowly excavate, meeting for a distance equal to one-seventh of length of carapace. Frontal lobe distinctly marked off; ocular lobe more than twice as wide as long and less than one-fourth greatest breadth of carapace; it has three not very large lenses.

First to fourth pedigerous somites successively increasing in dorsal length; second to fourth with a pair of dorso-lateral carinae, first with similar but fainter carinae, and fifth with a pair of dorso-lateral tumidities; third somite moderately produced fore and aft on the sides, but second and third legs separated by an interspace no greater than that between any of the others.

Pleon distinctly longer than cephalothorax, the distal somites rather slender; fifth fully half as long again as sixth, which is scarcely at all dilated posteriorly, where it is as wide as long; telson narrowly cordate, longer than sixth somite but shorter than fifth, and with fully one-third of its length post-anal; it is armed with

a pair of rather long terminal spines, flanked on the left by a lateral spine, on the right side by two spines.

First antenna relatively small and robust; first peduncular joint a little longer than second and third combined, the last little longer than second; flagellum four-segmentate and quite as long as peduncular joint; accessory flagellum fully half as long as main lash, composed of four joints, the last of which is minute. Second antenna with the eleven-segmentate flagellum barely longer than peduncle.

Mandible with nine or ten spines in the row.

Third maxilliped with basis only about one-tenth longer than rest of limb.

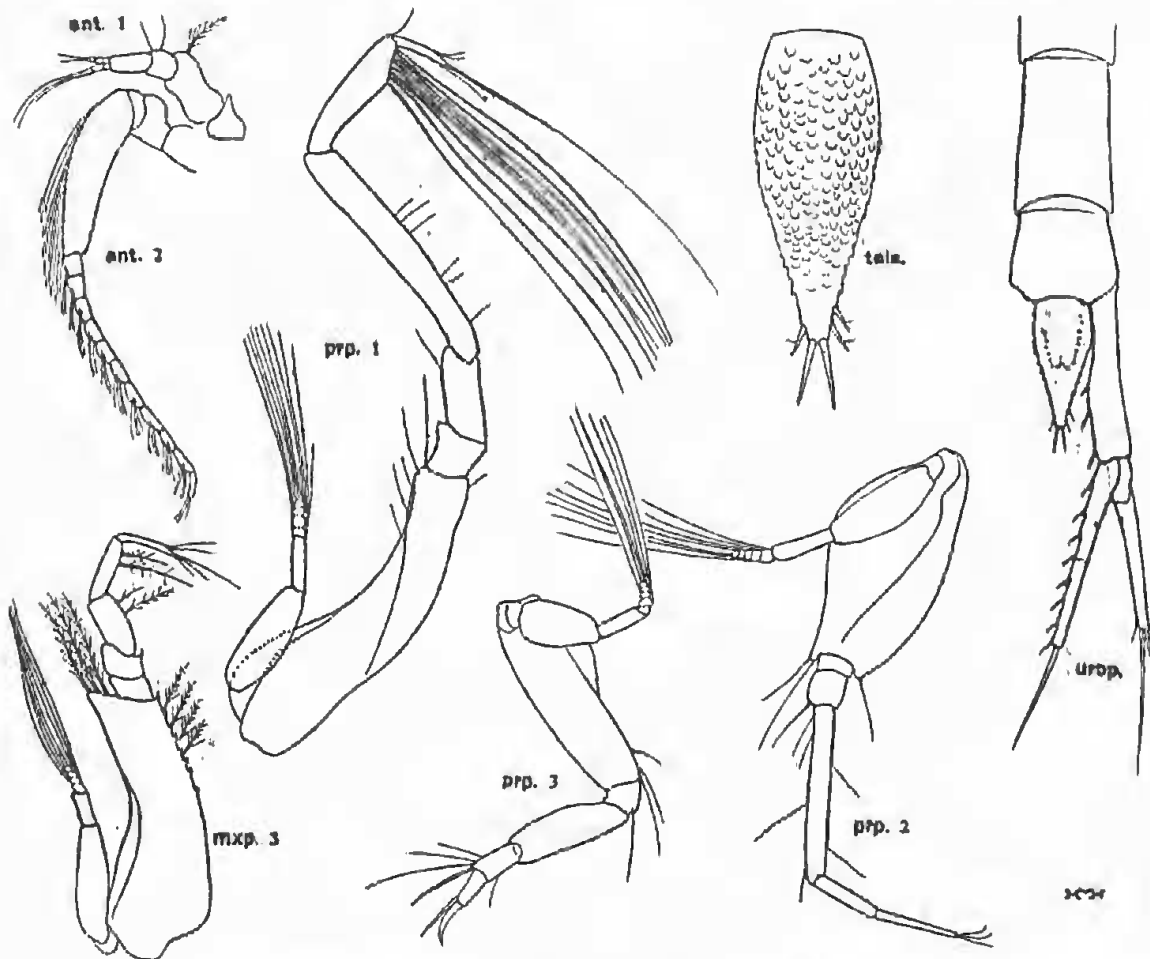


Fig. 10. *Gynodiastylis dilatata*, type male; ant., first and second antennae with upper lip; mxp. and prp., third maxilliped and first to third pereopods; urop., uropod and fifth and sixth pleon somites, and telson (all $\times 56$); teln., telson ($\times 125$).

First pereopod long, the carpus reaching beyond level of apex of pseudo-rostrum; basis less than two-thirds as long as rest of limb; carpus elongate, about three-fourths as long as basis, and twice as long as propodus, which is more than twice as long as dactylus; the propodus has, in dilated distal third, a series of long setae which, like terminal seta of dactylus, are almost half the total length of the limb.

Second pereopod with exopod as long as the stout basis, which is approximately two-thirds the length of rest of limb; ischium relatively large; carpus elongate, and distinctly more than twice as long as propodus, which is five-sixths as long as the slender dactylus.

Third and fourth peraeopods with well-developed exopods and with basis shorter than remaining joints together; merus barely half as long again as carpus and propodus together; the last of the carpal setae is shorter and a little stouter than the preceding seta and, unlike the stout propodal seta, does not reach to

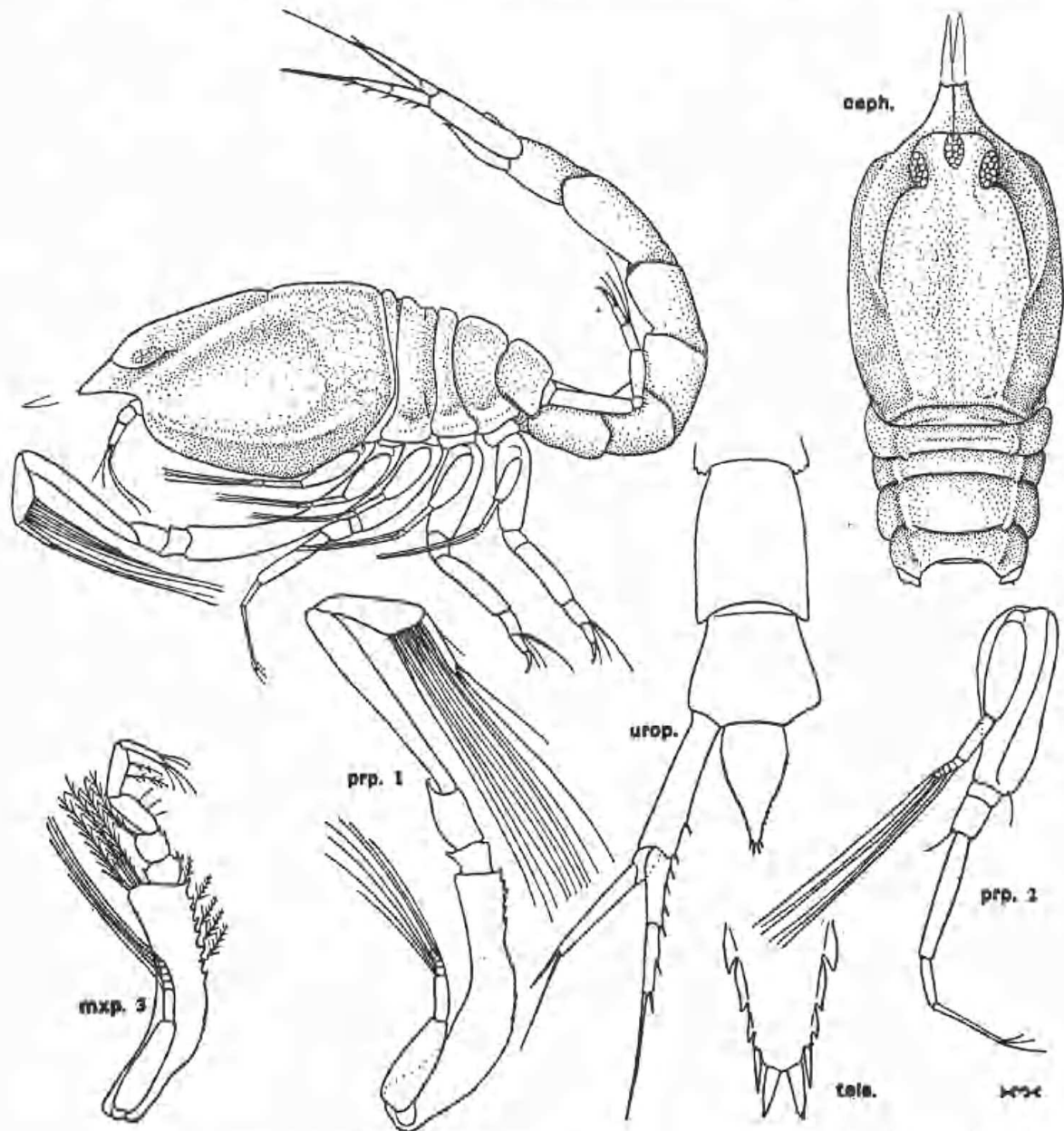


Fig. 11. *Gynodiastylis dilatata*, large-eyed male; lateral view and (ceph.) cephalothorax from above ($\times 42$); mxp. and prp., third maxilliped, and first and second peraeopods; urop., uropod with fifth and sixth pleon somites, and telson (all $\times 56$); tels., distal end of telson ($\times 280$).

level of tip of the sharply pointed, curved dactylus. Fifth peraeopod a little shorter and more slender than fourth, with merus about equal in length to carpus and propodus together.

Peduncle of uropod one-third as long again as telson, as long as exopod, and with three short spines on distal half of inner margin; endopod a little longer than exopod, two-segmentate, the first joint with four spines on inner margin and a little longer than second, which has four short inner spines and a terminal spine

almost two-thirds as long as the ramus; longer of the unequal terminal spines of exopod a little longer than that of endopod.

Colour white, Length 3 mm.

Loc. New South Wales: Ulladulla, Brush Island, 45 fath., in fine silt on flat-head grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2704.

Large-eyed male. The considerable differences between fully mature and sub-adult males in *Alloidiastylis* and *Zimmeriana* gen. nov. lead one to place here a large-eyed adult male which agrees with the type in plan of sculpture and generally in the proportions of the appendages. It may be that two forms of mature male occur, or that this is the ultimate male form of the species. Unfortunately, in many of the *Diastylids* now dealt with females are taken far more frequently than are males, and the notes on this sex in *Gynodiastylis* and allied genera are based upon only a few specimens.

The following comparative details concern the large-eyed male in question (fig. 11).

The integument is semi-transparent, of almost glass-like brittleness; carapace with distinct reticulations, which are much larger on posterior portions of sides than elsewhere. Pleon with imbricate patterning.

Carapace one-third of total length of animal and not much wider than deep; the carinae are swollen, the lower lateral one in particular more in the nature of a fold surmounted by a carinate line; seen from the side the dorsum exhibits the same indentation at middle of length because of the tumid branchial regions and elevated mid-line of anterior half. Antero-lateral margin not at all excavate; antero-lateral angle rounded, with three or four insignificant blunt denticles, and inferior margin not serrate towards front. Pseudorostrum of same length as in type but decidedly downbent. Frontal lobe very large, with sutures distinct; ocular lobe swollen, more than one-third as wide as carapace, not quite twice as broad as long, constricted somewhat at base and with three big, colourless oval lenses, which exhibit distinct granular structure.

Pedigerous somites with dorso-lateral carinae swollen.

Telson with a pair of short terminal spines, flanked on each side by a single more slender spine; lateral margins distinctly serrate.

The second antennae are furnished with exceedingly dense sensory setae; the flagellum is not longer than peduncle.

Third maxilliped with basis more than one-third as long again as remaining joints together.

First and second pereopods as in type excepting that the dactylus is definitely longer; that of the first is more than half length of propodus, that of second half as long again as propodus.

Second segment of endopod of uropod with only two spines on inner margin but with terminal spine almost as long as the whole ramus.

Length 2.75 mm.

Loc. New South Wales: off Eden, 30 metres, in coarse sand (K. Sheard, A. Trawl, Oct., 1943).

A juvenile male, 2.24 mm. in length, and with exopods of third and fourth pereopods not fully developed, was taken by Mr. Sheard eleven miles off Eden, at a depth of 120 metres; while in many respects resembling the examples described above, this differs in having the first legs relatively longer, the carpus reaching for fully half its length beyond the apex of pseudorostrum. The endopod of the uropod is three-segmentate, the first joint not quite as long as second and third combined, and the second shorter than third. This is tentatively regarded as a young example of *dilatata*, but may represent another species.

GYNODIASTYLIS AMPLA sp. nov.

Female with developing marsupium. Integument calcified, opaque, with fine but distinct reticulate patterning.

Carapace two-sevenths of total length of animal and less than one-fourth as long again as pedigerous somites together; it is two-thirds as long as greatest width, which is equal to the depth. The most prominent features of the sculpturing are (1) a straight longitudinal ridge running back from below antennal tooth for greater part of length of carapace; (2) a pair of dorsal, longitudinal ridges

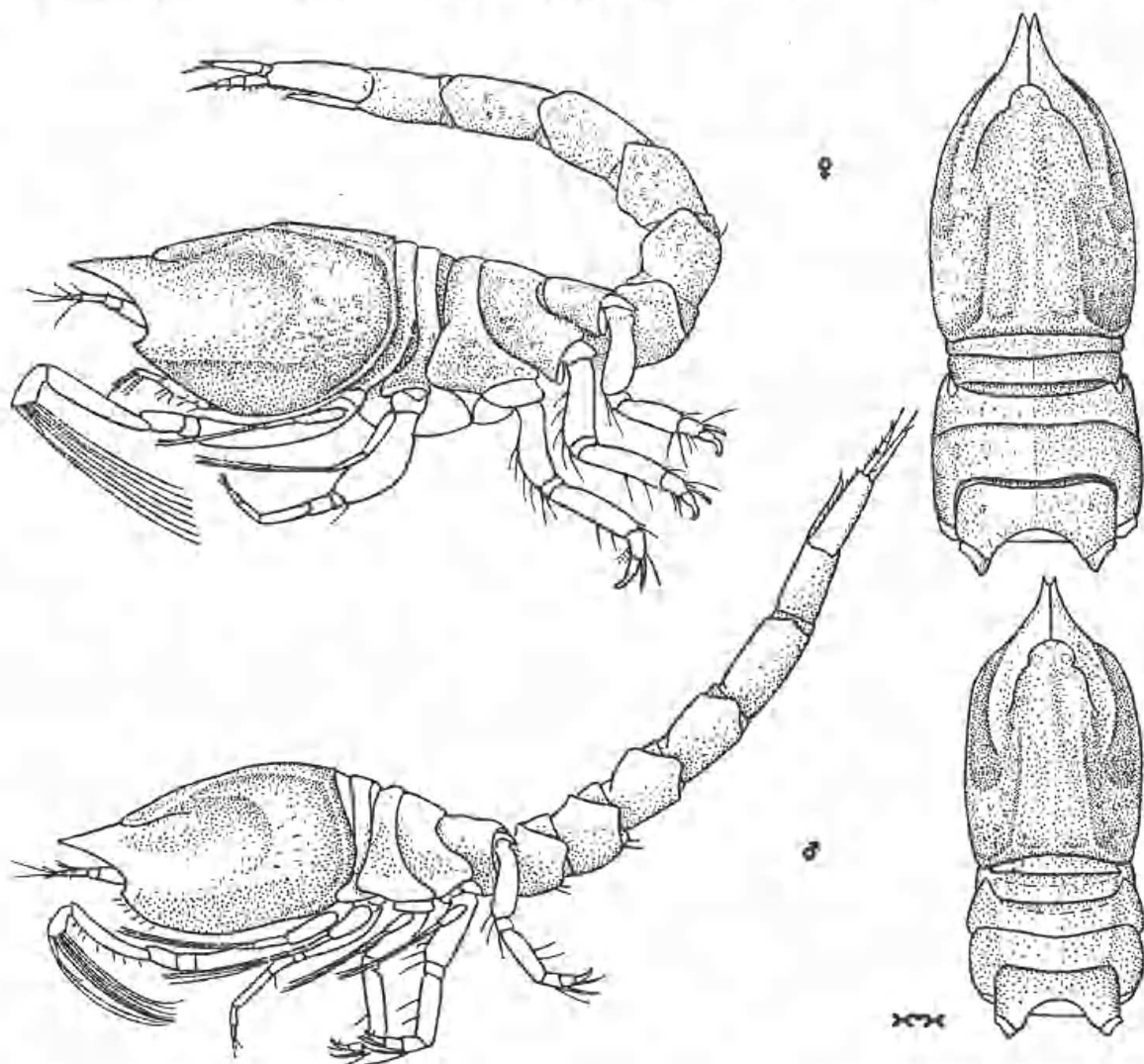


Fig. 12. *Gynodiastylis ampla*, type female and male; lateral views and cephalothorax from above ($\times 13\frac{1}{2}$).

on posterior half, and meeting the raised posterior margin of carapace; (3) a depression on each side for anterior two-thirds of length: the upper edge of this hollow is marked by a fold which is most apparent when the carapace is viewed from above. There is a shallow concavity on each side of frontal lobe and the hinder parts of the sides are marked with faint pits, the interspaces forming incipient wavy ridges. Antero-lateral margin markedly concave; antennal angle acute, and margin below it finely serrate. Pseudorostrum long and pointed, the lobes meeting in front of ocular lobe for a distance equal to about one-fifth length of carapace, slightly gaping near apex. Sutures of frontal lobe distinct; ocular

lobe much wider than long, much less than half length of pseudorostrum, and with three pale lenses.

Pedigerous somites (like those of pleon) with shallow, irregular, large pitings; somites successively increasing in length dorsally; fourth and fifth as wide as carapace, the others narrower; pleural parts produced forwards on second

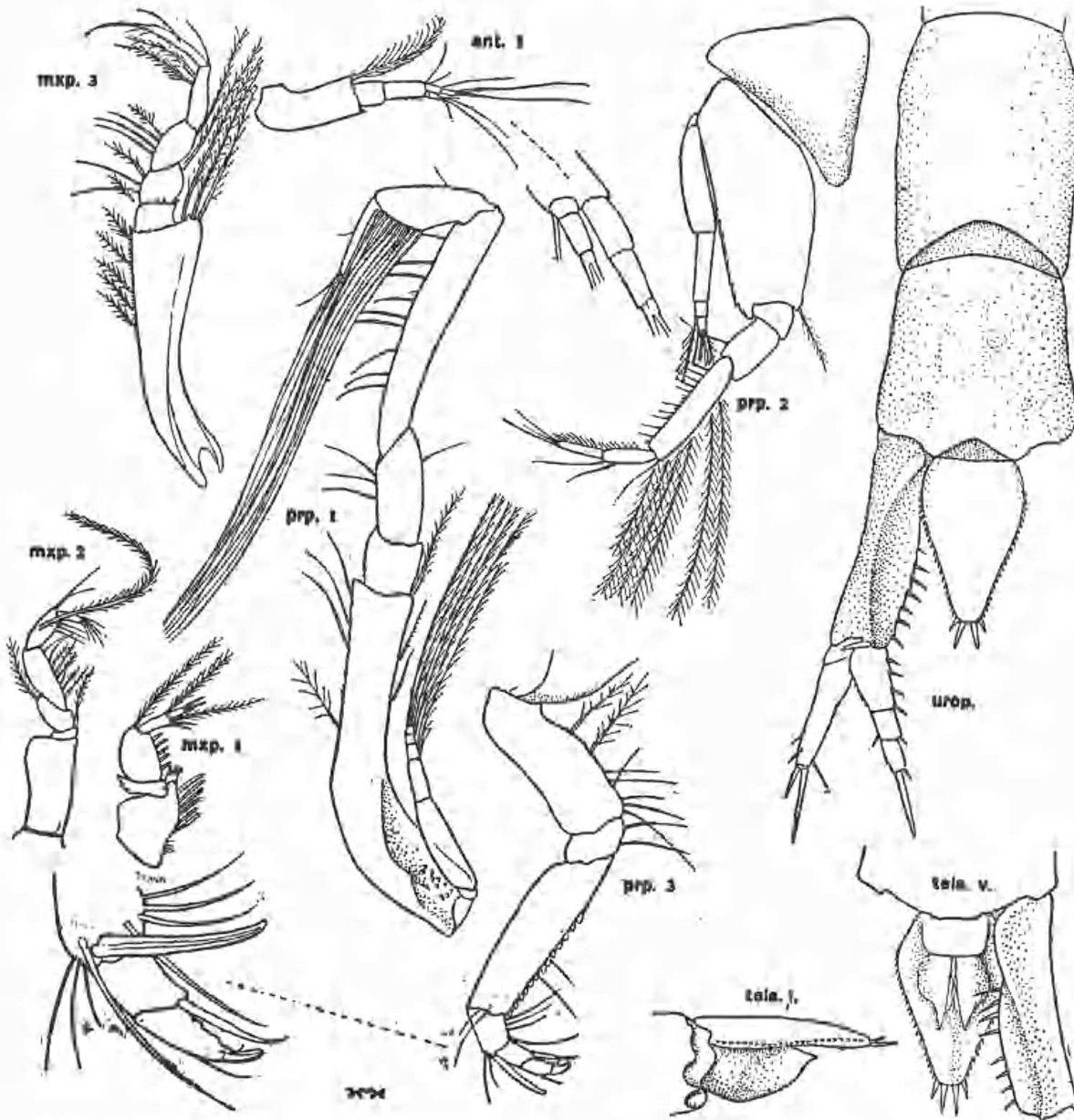


Fig. 13. *Gynodiastylis ampla*, type female; ant., first antenna ($\times 32$; flagella, $\times 240$); mxp., first to third maxillipeds ($\times 32$); prp., first to third peraeopods ($\times 32$; distal portion of third leg, $\times 75$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 32$); tels. v., ventral view of telson and peduncle of uropod ($\times 32$); tels. l., telson from the side ($\times 32$).

and third somites, and backwards on third to fifth; fourth with a pair of indistinct longitudinal dorsal ridges.

Pleon equal in length to cephalothorax; somites depressed; fifth half as wide again as deep, one-third as long again as width and a little longer than sixth somite, which is little longer than wide, scarcely dilated posteriorly, and has the hinder margin medianly incised on the back; telson not very much shorter than sixth

somite, with lateral serrations fine, and with the two terminal spines flanked on each side by a shorter spine.

First antenna with first joint of peduncle long, projecting well in front of carapace, and longer than second and third joints together; second two-thirds as long as third, and equal in length to the two-jointed main flagellum, which is twice as long as accessory lash. Second antenna three-jointed, only about one-third as long as first pair.

First and second maxillipeds with basis short (see figures).

Third maxilliped elongate, its dactylus reaching forward to level of middle of length of pseudorostrum; basis narrow, slightly dilated distally and a little longer than rest of appendage; carpus, propodus and dactylus subequal in length, the last-named slightly the longest.

First pereopod with merus reaching almost to level of antennal angle; basis distinctly more than one-half of rest of limb (when extended); propodus equal in length to merus and less than half as long as carpus; dactylus more than two-thirds as long as propodus; propodal and dactylar setae longer than ischium, merus and carpus together.

Basis of second pereopod shorter than rest of limb; ischium relatively large; carpus nearly twice as long as merus, and longer than propodus and dactylus together; dactylus a little shorter than propodus and with distal setae longer than the joint.

Posterior pereopods robust, as usual without trace of exopods, and with merus in all considerably longer than basis; carpus, propodus and dactylus short, together not much more than half length of merus; carpus with one of the distal setae enlarged to form a blunt-ended, stout spine, which reaches almost to tip of dactylus (fig. 13, bottom left); propodal seta stout (but more slender than above-mentioned carpal seta) tapering to the subacute apex.

Peduncle of uropod less than one-third as long again as telson, broad (less than four times as long as breadth) excavate longitudinally on interior face and with a row of eight or nine spines on inner edge; rami subequal in length; endopod three-fifths as long as peduncle, with its proximal joint equal in length to the other two subequal joints; first joint with four inner spines, the others each with one, and second with one at inner distal angle also; terminal spine half the length of ramus; exopod with two unequal terminal spines, one slightly longer than that of endopod.

Colour white. Length 9.3 mm.

Adult male. Carapace much as in female, but the antero-lateral angle is less emphasized, and the ocular lobe slightly larger; it is three-fourths as long again as pedigerous somites, which together are shorter than in the other sex. First pedigerous somite concealed on sides.

The pleon is one-tenth as long again as the cephalothorax. The lateral spines of the telson are almost as long as the terminal spines.

Exopods are present on the third maxilliped and first to fourth pereopods; those of the last two pairs of legs are smaller than the others, but have peduncle and five-jointed flagellum, furnished with long plumose setae. The appendages otherwise are as in the female excepting for trivial differences; there are five instead of four spines on the first joint of endopod of uropod.

Length 8.2 mm.

Loc. New South Wales: Ulladulla, 75 metres (K. Sheard, A. Trawl, mesh 40, July, 1944). Types in South Australian Museum, Reg. No. C. 2654 and 2681.

This form is larger than any of the other species of the genus. The division of the endopod of the rather massive uropod into segments is much more distinctly marked than in some other members of the group having this ramus trisegmentate and the setae of the thoracic exopods are comparatively well-developed and strongly plumose.

GYNODIASTYLIS SUBTILIS sp. nov.

Female with developing marsupium. Integument well calcified, brittle, with surface smooth and somewhat polished.

Carapace robust, distinctly less than one-third of total length of animal, one-third as long again as pedigerous somites together, as wide as, and not much longer than, depth; dorsum boldly arched in lateral view, sides rounded and slightly sinuate as seen from above; the only sculpture is a curved furrow behind antero-lateral angle and the serrated inferior margin posterior to this angle. Antero-lateral margin shallowly and evenly concave; antero-lateral angle defined by the first of abovementioned serrations. Pseudorostral lobes truncate in front, the external apical angle forming a small tooth; they meet for a distance equal to about one-fifth length of carapace. Frontal lobe distinctly defined; ocular lobe rounded, short and broad with three pale lenses.

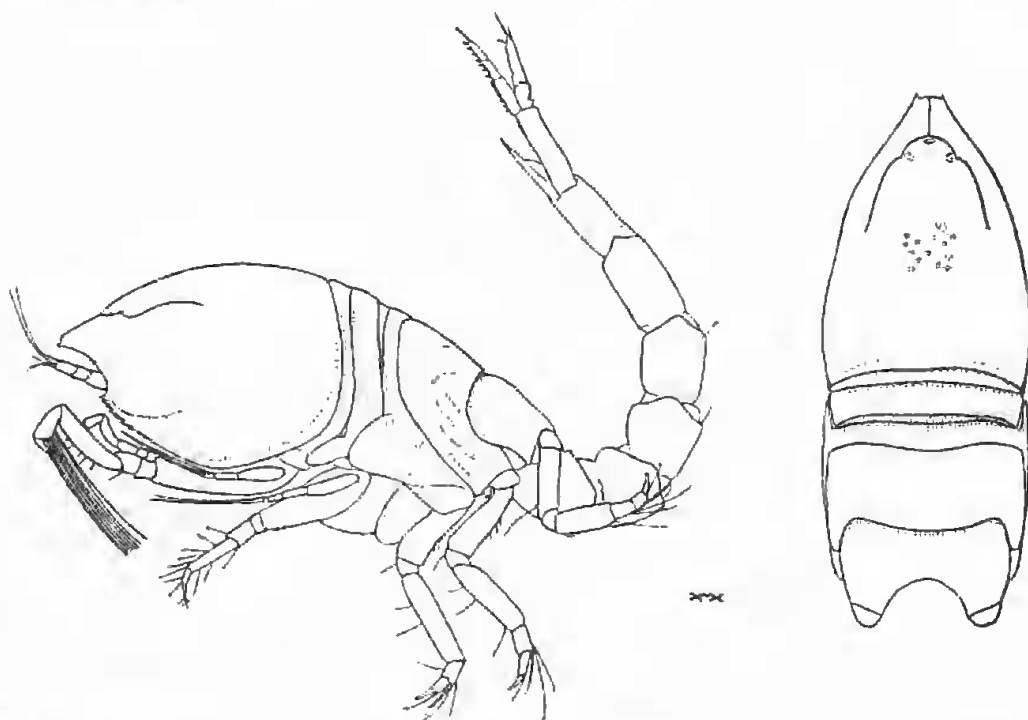


Fig. 14. *Gynodiastylis subtilis*, type female; lateral view and cephalothorax from above ($\times 25$).

Anterior pleural portions of second pedigerous somite produced forwards as a narrow lobe; third with similar but much deeper anterior lobe and also extended well backwards; the second and third legs are distinctly separated (probably widely separated in ovigerous female); fourth and fifth somites much longer dorsally than the others.

Pleon a little longer than cephalothorax; fifth somite one-third as long again as sixth, which is as wide as long and twice as long as deep; telson almost as long as sixth somite; tapering, but not markedly narrowed to the rear, laterally serrate, rounded above, and with a post-anal portion equal to about half the length of proximal part; there is a pair of stout apical spines, flanked by a similar spine on each side; at third fourth of length there is a further lateral spine on the right side and nearly opposite this, on the left, a bristle.

First antenna with third peduncular joint not much longer than second; the two-jointed accessory flagellum is half as long as the main lash.

Third maxilliped wide, the basis more than one-third as broad as long, and equal in length to rest of appendage; ischium and merus shorter than any of the other joints, but merus unusually wide, expanded externally; propodus a little longer than carpus and half as long again as dactylus.

First peraeopod short, the carpus not quite reaching level of apex of pseudo-rostrum; basis almost as long as rest of limb and with a couple of inner distal spines; carpus long, more than half length of basis, and more than twice as long as the short and broad propodus; dactylus with long terminal setae but itself very

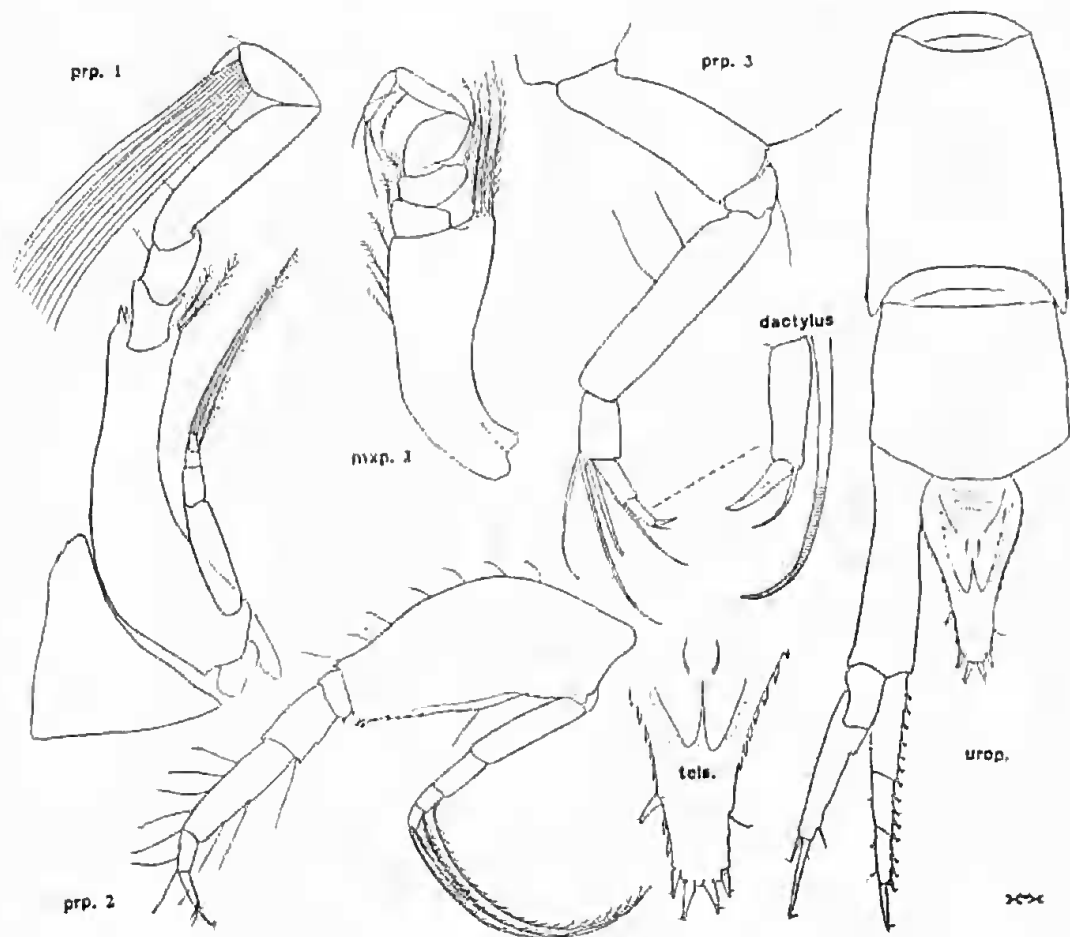


Fig. 15. *Gynodiastylis subtilis*, type female; mxp. and prp., third maxilliped and first to third peraeopods ($\times 60$; propodal seta, and dactylus with its claw and seta, $\times 230$); urop., uropod with fifth and sixth pleon somites, and telson, ventral aspect ($\times 60$); tels., ventral view of postanal part of telson ($\times 115$).

short, not much more than one-third as long as propodus, which bears a dozen setae, like those of dactylus very long.

Second peraeopod robust; basis serrate on inner edge and as long as rest of limb; ischium distinct, with a small inner spine; carpus two-thirds as long again as merus, which is as long as the short, subequal, propodus and dactylus together; marginal setae of the limb are long but terminal setae of dactylus are short.

Third to fifth peraeopods relatively long, the third and fourth exceeding the second leg in length; the merus is twice as long as carpus and propodus together; the longest distal carpal seta, immediately preceding the usual shorter and stouter seta, extends well beyond apex of dactylus, as does also the propodal seta; dactylus with separated claw, at base of which is a seta (see dactylus, in fig. 15).

Uropod with the unarmed peduncle fully as long as telson, and slightly exceeding endopod in length; exopod little shorter than endopod, with terminal spine stout, less than half as long as the ramus and three times as long as an outer sub-terminal spine; endopod composed of three joints, the first equal to combined length of the other two, which are subequal in length; inner margin of endopod unusually well endowed with spines for female of the genus, there being seven, four and three on the respective joints; terminal spine short and stout, not exceeding last joint in length.

Colour milky white. Length 4.4 mm.

Loc. New South Wales: Ulladulla, 75 metres (K. Sheard, A. Trawl, June, 1944). Type in South Australian Museum, Reg. No. C. 2671.

This species bears a general resemblance to *polita* but is at once distinguished by the shorter first pereopod, the considerable differences in the other appendages and above all by the very different telson.

GYNODIASTYLIS CARINIROSTRIS sp. nov.

Ovigerous female. Integument lightly calcified, not at all brittle, but tough and not easily torn.

Carapace one-third of total length of animal and barely longer than pedigerous somites together; it is almost twice as long as deep; from above it is subtriangular, widest near posterior end, where it is distinctly wider than deep; pseudorostral

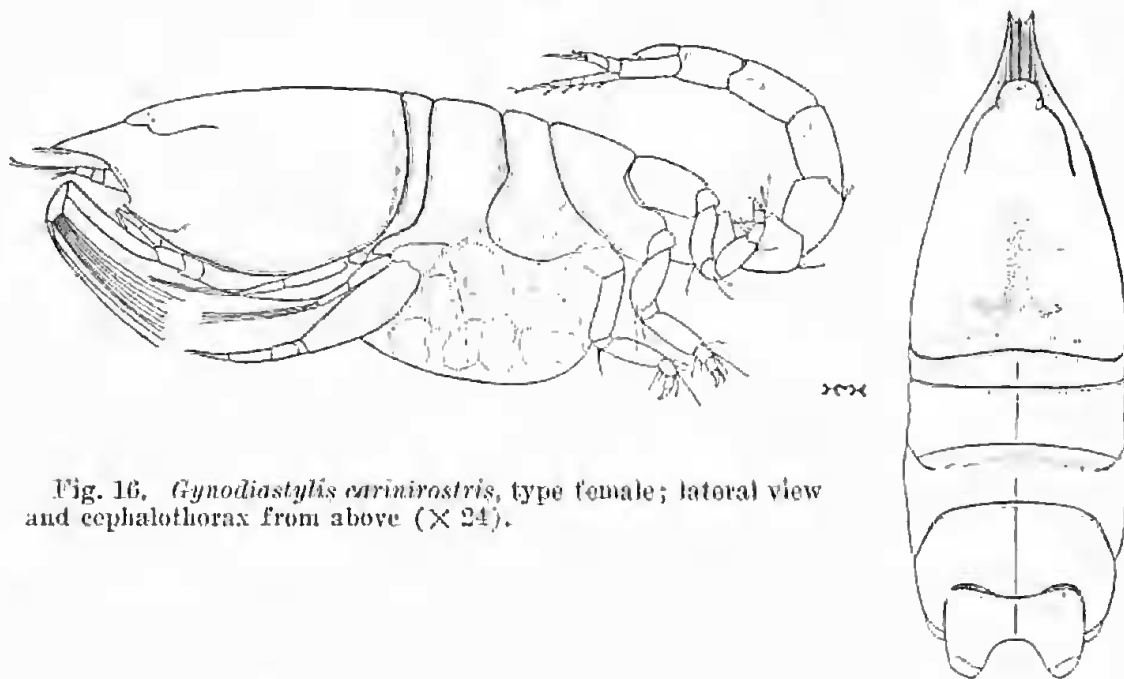


Fig. 16. *Gynodiastylis carinirostris*, type female; lateral view and cephalothorax from above ($\times 24$).

lobes each a sharp, longitudinal, dorsal carina running from apex to ocular lobe; posterior half of carapace with a faint median dorsal depression, flanked at hinder end by a pair of pits; sides without sculpture except for a very shallow, short, curved furrow extending back from antero-lateral angle; antennal notch distinct and angle acute. Pseudorostral lobes narrow, acute anteriorly, meeting for a distance equal to fully one-fifth of length of carapace. Ocular lobe rounded, wider than long, with three colourless corneal lenses.

Pedigerous somites smooth, the first much shorter than any of the others which do not differ markedly in length; pleural parts of second and third expanded for-

wards, and of third and fourth markedly backwards, the coxae of second and third pereopods very widely separated; as on earapaeae there are a few pellucid dorsal spots and each somite has a median dorsal wavy line, absent on earapace.

Pleon barely longer than earapace; fifth somite not much longer than sixth, which is considerably depressed, a little wider than long; telson short (about three-

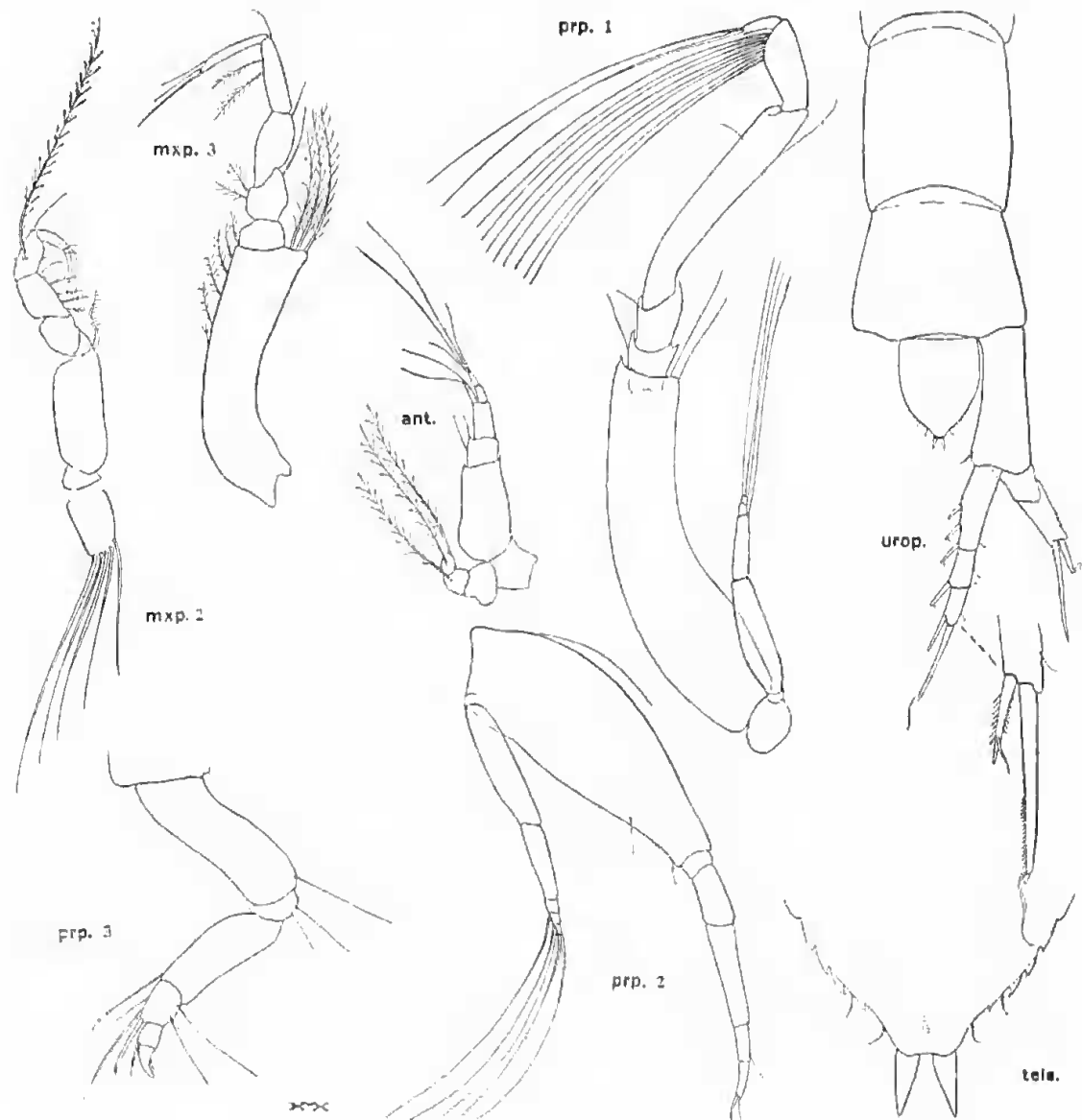


Fig. 17. *Gynodiastylis carinirostris*, paratype ovigerous female; ant., first and second antennae ($\times 56$); mxp., second and third maxillipeds ($\times 56$); prp., first to third pereopods ($\times 56$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 56$; spines of endopod, $\times 126$); tels., distal end of telson ($\times 286$).

fourths as long as sixth somite), subconical, with two short, stout apical spines, two pairs of lateral bristles and with lateral serrations in distal third; there is no distinct post-anal portion.

First antenna with first joint of peduncle as long as rest of appendage including flagellum; second joint shorter and stouter than third. Second antenna three-jointed with long plumose setae.

Mandible with nine or ten spines.

Third maxilliped slender, elongate, the propodus reaching quite to antennal angle; unarmed but with the usual setae; basis barely equal in length to remaining joints together; carpus, propodus and dactylus equal in length, each almost as long as ischium and merus together.

First peraeopod short, the carpus not reaching level of apex of rostrum; basis subequal in length to rest of limb; carpus elongate, two-thirds as long as basis and three times as long as the short propodus, which is furnished with a fan of nine or ten long setae; dactylus very short, less than half length of propodus, with a pair of long distal setae.

Second peraeopod with the stout basis not much longer than remaining joints together; ischium distinct, relatively large; carpus more than half as long again as merus; propodus and dactylus subequal in length, each not much more than one-third as long as carpus; terminal dactylar setae short, one stout.

Third to fifth peraeopods all approximately same size; the broad merus is about twice as long as carpus and propodus together; dactylus short, stout and blunt.

Peduncle of uropod as long as sixth pleon somite, two and one-half times as long as wide, with a short inner spine near distal end; endopod a little longer than peduncle; three-jointed, the first segment fully as long as second and third joints together and with three inner spines; the last two each have one inner spine, that of third subdistal; terminal spine as long as first joint; exopod stout and short, only as long as first joint of endopod, and with the longer of its two terminal spines as long as the ramus.

Colour white. Length 4.7 mm.

Loc. New South Wales: Botany Bay, off Kurnell, 20 feet (W. Fairbridge, Aug., 1943). Type in South Australian Museum, Reg. No. C. 2669.

Several females with eggs or embryos in the marsupium.

GYNODIASTYLIS TRUNCATIFRONS Hale.

Gynodiastylis truncatifrons Hale, 1928, p. 43, fig. 13-14 and 1937, p. 65.

Ovigerous female. Re-examination of the type shows that in that example the uropods have been mutilated during life; normally the endopod in the female is fully as long as the peduncle and is three-, not two-jointed, with the first joint longer than second, which is barely longer than third; the longest terminal spine is fully three-fourths as long as the ramus and the joint bears respectively three, two and two short inner spines; exopod as long as the two proximal joints of endopod.

The antero-lateral angle is emphasized by a slender spine, posterior to which the inferior margin bears a row of similar teeth.

An ovigerous female from Sellick's Reef, South Australia, is only 3.7 mm. in length, only half as long as the type.

A rather extreme range in size of ovigerous females associated in the same situation is found also in *similis* Zimmer.

Adult male. An adult male from Memory Cove, South Australia, is nearly 5 mm. in length; exopods are well developed on the first four pairs of peraeopods.

Some examples about 3.2 mm. in length are available from New South Wales (4 miles off Eden, 70 metres, K. Sheard, Oct., 1943); one of these is here illustrated. The antennal spine, and the spines posterior to it are shorter than in the females and the antero-lateral portion of the carapace is denticulate above the curved lateral groove. The telson bears a pair of apical spines, flanked by a similar spine on each side, all being relatively larger than in the female.

The first antenna has the first joint of peduncle longer than second and third together, and second shorter than third; the slender three-jointed accessory flagel-

lum is half as long as the main lash, which is apparently four-jointed. The eleven-jointed flagellum of the second antenna is as long as the peduncle.

The first peraeopod has the carpus a little more elongate than in the female and as in the latter the ischium bears two distal spines, and the merus one or two.

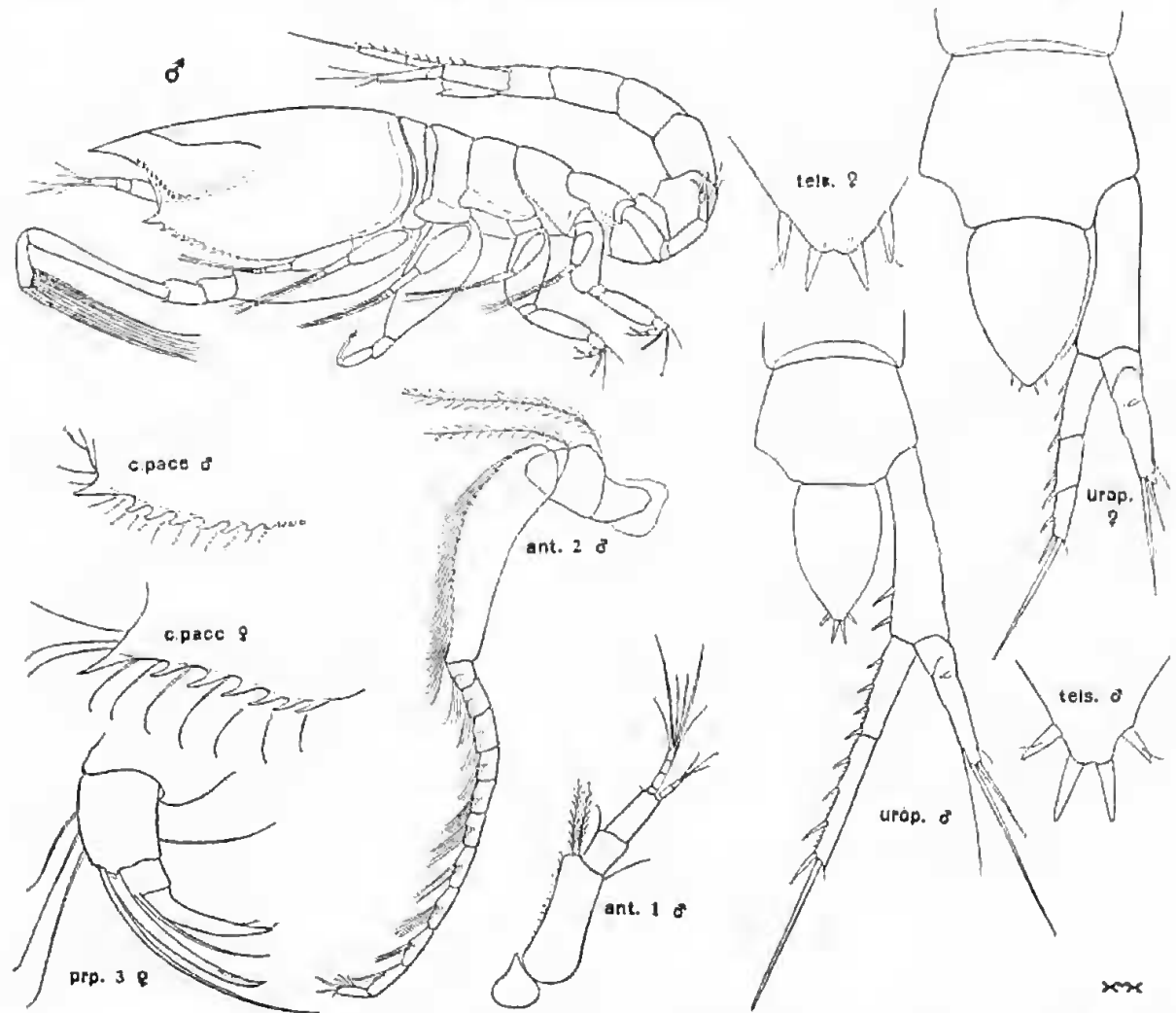


Fig. 18. *Gynodiastylis truncatifrons*, adult male (3.2 mm., New South Wales) and ovigerous female (3.7 mm., South Australia); lateral view of whole animal ($\times 30$); c. pacc, antero-lateral angle and inferior margin of carapace ($\times 72$); ant., first and second antennae ($\times 72$); prp. 3, distal joints of third peraeopod ($\times 120$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 72$); tels., distal end of telson ($\times 240$).

The endopod of the uropod is one-fifth as long again as the peduncle; it is divided into only two joints, each of which bears four inner spines; the first joint is about three-fourths as long as second, the long terminal spine of which is longer than its joint; exopod not much more than half as long as endopod, its longest terminal spine longer than ramus and longer than that of endopod.

GYNODIASTYLIS POLITA sp. nov.

Ovigerous female. Integument smooth and polished, the only sculpture being a faint, curved depression on side of carapace, running back from antennal angle to about middle of length, and not margined by folds or ridges.

Carapace less than one-third of total length, and two-thirds as long again as deep; seen from above it is subtriangular in shape, tapering to the front and broad

at the rear, where it is considerably wider than deep. Antero-lateral margin below pseudorostrum perpendicular, not at all concave; antero-lateral angle with a tiny tooth, behind which are two similar denticles. Pseudorostrum nearly one-fifth of total length of carapace; each lobe is narrowly truncate in front with the upper (or inner) distal angle produced as a minute tooth which rests against its fellow of the opposite side. Frontal lobe moderately large, distinctly defined; ocular lobe rounded, more than twice as wide as long, and with three pale lenses.

Pedigerous somites together about three-fourths as long as carapace; successively increasing in dorsal length to fourth, which is longer on mid-line of back than fifth; pleural parts of second produced well forwards and overlapping those of first; third somite expanded in front on the side (where it overlaps the second) and also much to the rear, the second and third legs being widely separated; it is completely fused with the fourth somite on the back and dorso-laterally, but not so

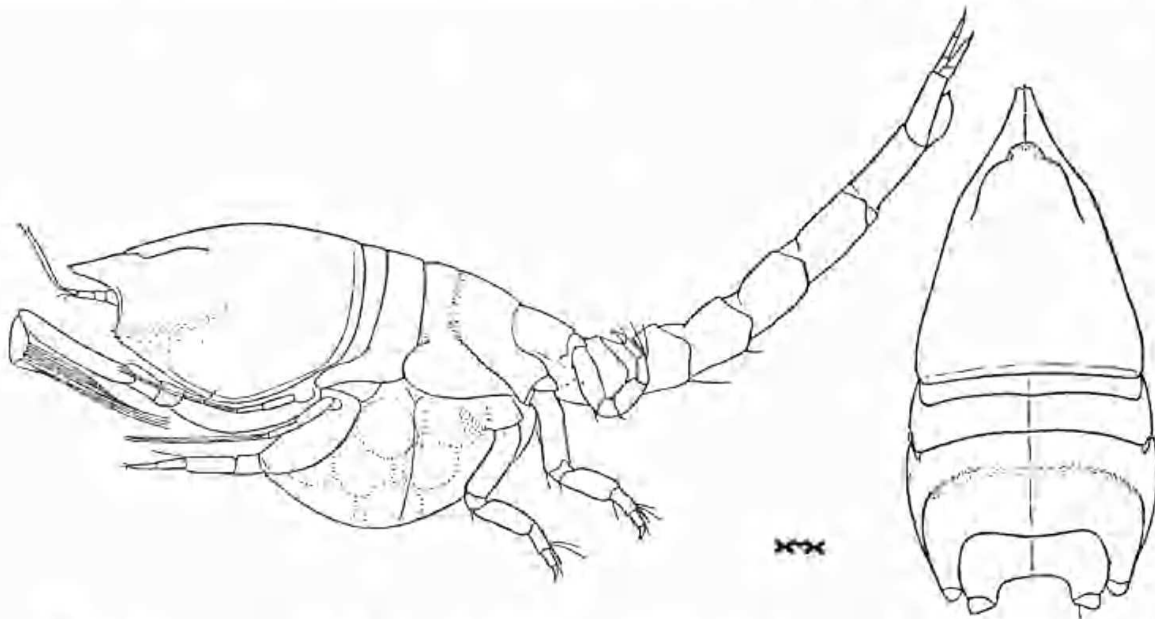


Fig. 19. *Gynodiastylis polita*, type female; lateral view and cephalothorax from above ($\times 22$).

completely on lower part of sides; there is the fine median longitudinal line on all somites (apparent in several species), but no real carinae or folds.

Pleon shorter than cephalothorax, not depressed; the fifth somite is half as long again as wide and is one-fifth longer than the sixth somite which is little broadened posteriorly, where it is as wide as long; telson about three-fourths as long as the fifth somite, plump, smooth and rounded with very short post-anal part; the apex bears a pair of short, stout spines, a little anterior to which, on each side, a small bristle is set in a tiny incision.

First antenna with proximal joint of peduncle a little shorter than second and third together; third more than half as long again as second; flagellum two-jointed, longer than second peduncular segment; accessory flagellum elongate, nearly as long as first joint of main lash and apparently single-jointed. Second antenna with three segments not differing much in length, the setae of the last two as long as first antenna.

Mandible with nine or ten spines in the row.

Third maxilliped with palp elongate; with the appendage extended the propodus reaches to level of apex of pseudorostrum; basis about two-thirds as long as rest of limb, little expanded distally; merus somewhat expanded, carpus longer

than ischium and merus together, and fully as long as propodus, which is little longer than dactylus.

First peraeopod robust, the carpus reaching beyond apex of pseudorostrum; basis about half as long as remaining joints together; carpus very long, fully two and one-half times the length of the propodus, which is broadened in distal third,

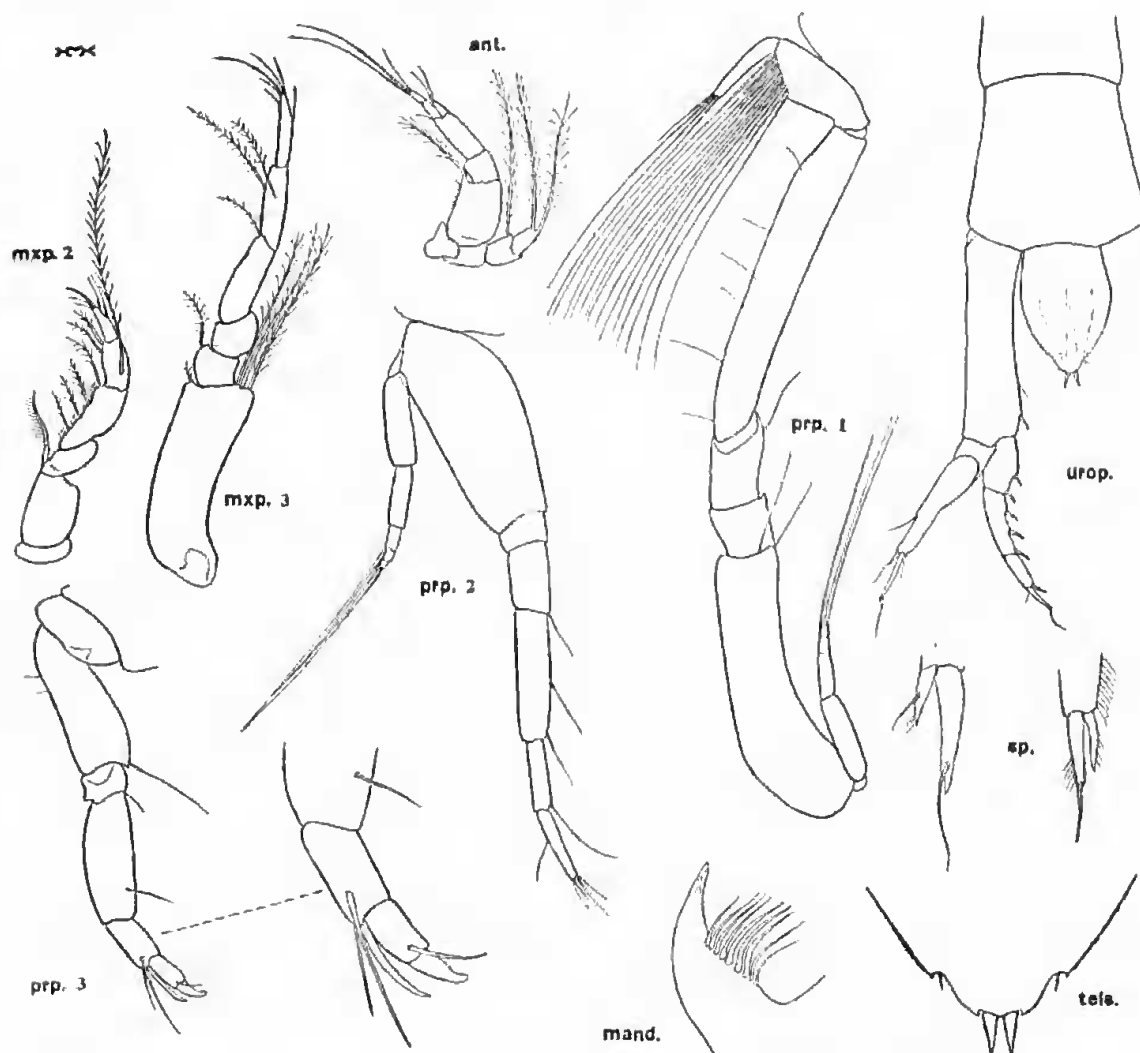


Fig. 20. *Gynodiastylis polita*, paratype non-ovigerous female; ant., first and second antennae ($\times 64$); mand., distal portion of mandible ($\times 120$); mxp., second and third maxillipeds ($\times 64$); prp., first to third peraeopods ($\times 64$; distal joints of third leg, $\times 120$); tels. and sp., distal end of telson and terminal spines of rami of uropod ($\times 240$). urop., Uropod of type ovigerous female, with sixth pleon somite and telson ($\times 55$).

where are seated a dozen very long inner setae; dactylus two-thirds as long as propodus and with long terminal setae.

Second peraeopod with basis shorter than rest of limb; ischium not distinctly separated off from basis; carpus more than half as long again as either merus or propodus, the latter almost equal in length to the dactylus.

In the third to fifth peraeopods the basis is not or barely longer than ischium and merus together; the merus in third and fourth pairs is little more than twice as long as carpus; one of the distal carpal setae is much stouter than the others and does not reach quite to the tip of the short, stout and blunt dactylus; propodal seta slender, reaching to tip of dactylus.

Peduncle of uropod more than half as long again as either exopod or telson, with a spine and a seta near distal end of inner margin; endopod curved like a bow, a little longer than exopod and composed of three segments, the second somewhat longer than first and nearly twice as long as third; the suture between second and third segments is not very distinct; the joints bear respectively two, three and one inner spines, the last subterminal; the terminal "spines" (really composite setae) of both exo- and endopod are stout, and are short unless one includes in their length the slender setal distal portion which emerges from the wide spine-like, proximal part (see fig. 20, sp.).

Colour white. Length 4.7 mm.

Female with developing marsupium. The carapace is relatively a little longer (one-third of total length) than in the ovigerous female and is not widened posteriorly, but is suboval in shape and not as wide as deep; the same little distal point is present on the pseudorostrum. Pedigerous somites together are not much more than half as long as the carapace; the third and fourth are not ankylosed to the same degree, while the second and third somites are less expanded on the sides, so that the third legs are separated from the second by a space little greater than that between the others; the pedigerous somites as a whole are, of course, not nearly so broadened as shown in fig. 19. The pleon is as long as the cephalothorax; its fifth somite is only one-fourth as long again as wide, but the telson is as in the adult.

At this stage the appendages differ in no important detail from those of the ovigerous female, excepting that the peduncle of the uropod does not reach much beyond end of telson, and is barely longer than the rami, while the endopod of this appendage has two, instead of three, inner spines on second joint.

Length 2.9 mm.

Similar differences occur between subadult and ovigerous females of other members of the genus and are here given because some species, owing to lack of other material, are described from females not fully mature.

Loc. New South Wales: 11 miles off Eden, 120 metres (subadult female, K. Sheard, A. Trawl, Jan., 1943); 5 miles off Eden, 60 metres, on mud (type loc., K. Sheard, submarine light, Dec., 1943); 4 miles off Port Hacking, 80 metres, on mud (K. Sheard, A. Trawl, May, 1944); Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2712.

The male was not taken at any of the above localities. In general the species resembles the smaller *hartmeyeri* Zimmer (1914, p. 187, fig. 14) from Western Australia but differs in the armed telson and in the much longer first peraeopod, the more prominent and dentate antero-lateral angle of carapace, etc.

GYNODIASTYLIS AMBIGUA sp. nov.

Ovigerous female. A.—(type). Integument smooth, thin but calcified.

Carapace less than one-third of total length of animal and equal in length to pedigerous somites together; twice as long as deep; seen from above it is subtriangular in shape, widest posteriorly, where it is half as broad again as depth; dorsum with an obscure median ridge on anterior half, not greatly arched as seen from the side. Antero-lateral margin concave; antero-lateral angle with two small teeth. Pseudorostral lobes narrow anteriorly and excavate, meeting for a distance equal to less than one-fourth of length of carapace. Frontal lobe well defined; ocular lobe subtriangular, with three faintly delineated lenses.

Second and fourth pedigerous somites longer dorsally than any of the others; pleural parts of second produced forwards, that of third somewhat expanded

in front and much produced to the rear, the second and third peraeopods being very considerably separated.

Pleon depressed, about one-third as long again as carapace; fifth somite barely longer than sixth, which is a little longer than broad; telson subeordate as seen from above, two-thirds as long as sixth somite; a short distal portion is post-anal with a pair of apical spines and near them on each side a lateral spine of about the same size; lateral serrations small.

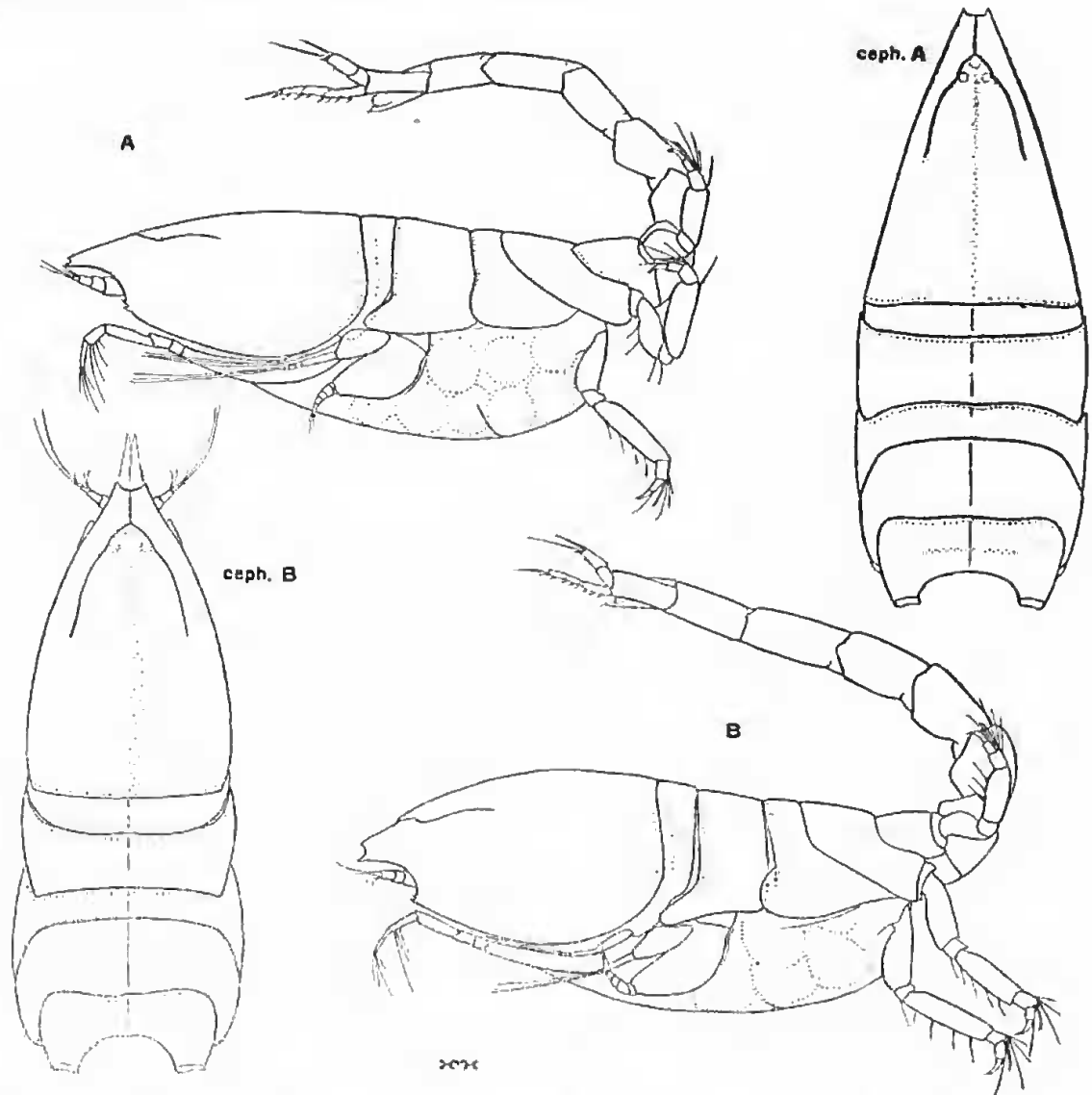


Fig. 21. *Gynodiastylis ambigua*, ovigerous females; lateral views, and (ceph.) cephalothorax from above, of type A— and variety —B ($\times 30$).

First antenna with first joint of peduncle longer than second and third together; flagellum two-jointed and accessory lash small.

Basis of third maxilliped three-fourths as long again as rest of limb; remaining joints not differing markedly in length.

First peraeopod short, barely reaching past apex of pseudorostrum when extended, the carpus reaching a little beyond level of antennal angle; basis three-fourths as long again as rest of limb, with a slender tooth at inner apical angle; propodus about three-fourths as long as carpus, a little longer than dactylus and about as long as merus; propodal setae sparse and not very long.

Second pereopod with exopod (not including setae) as long as basis, which is almost three times as long as rest of limb; ischium distinct, not much shorter than the abbreviated merus and carpus; propodus a little longer than carpus and about two-thirds length of dactylus.

Third and fourth pereopods longer than second; merus stout, longer than basis and more than twice as long as carpus and propodus together; the most distal of the carpal setae is short, claw-like, and much stouter than the other setae of this joint and than the propodal seta, which reaches well beyond tip of dactylus; fifth pereopod about as long as second.

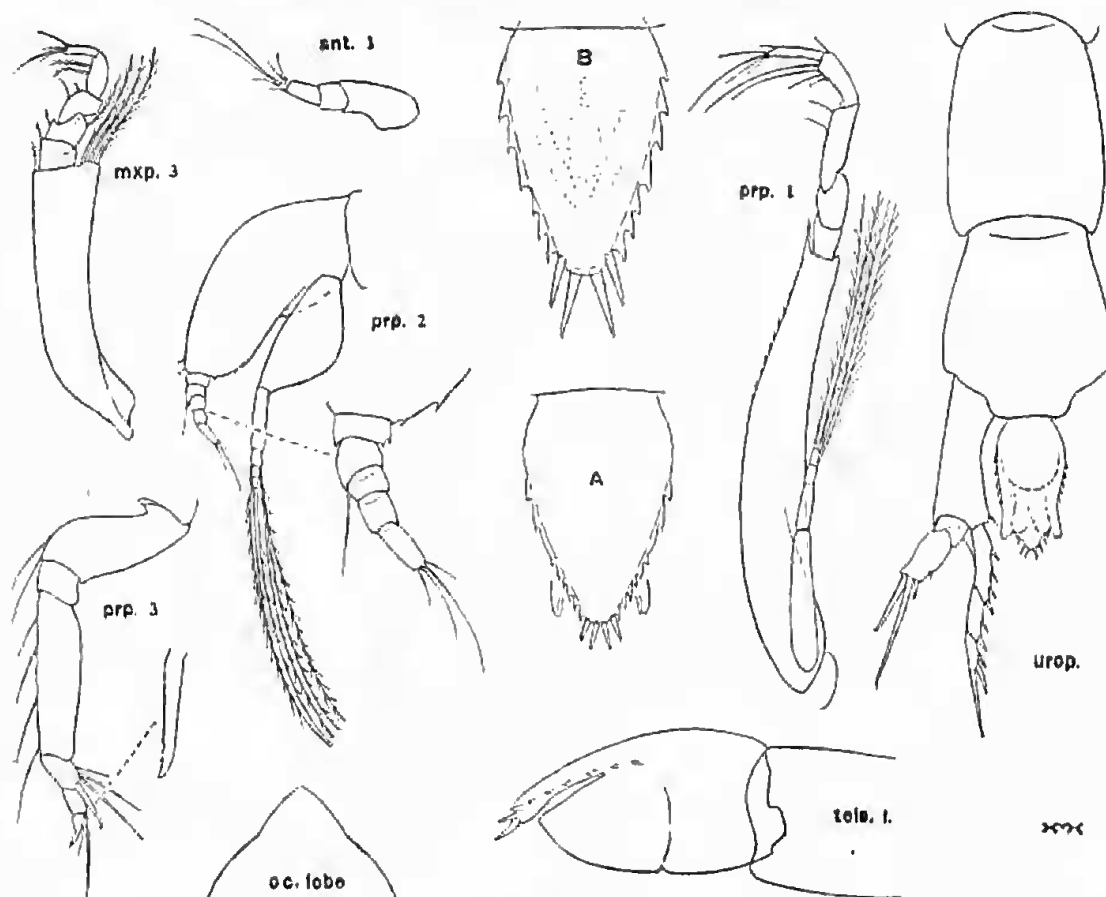


Fig. 22. *Gynodiastylis ambigua*, paratype female; oc. lobe and ant., ocular lobe and first antenna ($\times 56$); mxp. and prp., third maxilliped and first to third pereopods ($\times 56$; distal joints of second leg and carpal seta of third, $\times 125$); urop., ventral aspect of uropod with fifth and sixth pleon somites, and telson ($\times 56$); tels. l., lateral view of telson ($\times 125$). A, Telson of type female ($\times 125$). B, Telson of variety ($\times 125$).

Peduncle of uropod stout, about as long as telson, with one subdistal spine on inner margin; endopod equal in length to peduncle and twice as long as exopod, three-jointed, the first joint as long as second and third together; inner margin with four spines on first joint, two on second and two on third, the last subdistal and longer and stouter than the others; terminal spine half as long as ramus; exopod with three unequal terminal spines, the inner very short, the longest much longer than ramus and longer than terminal endopodal spine.

Colour white. Length 3.5 mm.

Loc. New South Wales: Jibbon Station, 70 metres, on sand (type female loc., K. Sheard, A. Trawl Station 9. Aug., 1943); 4 miles off Eden, 70 metres, in

silt (K. Sheard, Oct., 1943). Type in South Australian Museum, Reg. No. C. 2674.

Ovirigerous female, B.—(robust form). One of the examples from the type locality was at first set aside as a species distinct from the above because of the more robust carapace, the noticeably shorter first peraeopods, and the slightly longer exopod of the uropod. The appendages are otherwise close to those of the type.

The carapace is more arched dorsally as seen from the side and is relatively wider and deeper, with the sides, as seen from above, more convex. The whole frontal lobe is relatively wider.

In the third maxilliped the basis is a little shorter than in the type and the carpus of the first peraeopod reaches only to level of antero-lateral angle of carapace instead of beyond it, while the basis of this leg is only about half as long again as rest of limb, but has the long inner distal tooth as figured. The basis of the second peraeopod is relatively a little shorter, but the rest of the limb is composed of the unusually short joints as described. The robust distal carpal seta of the posterior legs is a trifle longer.

Uropods are much as in the type, but the exopod is two-thirds as long as endopod, there are three spines on inner edge of peduncle and five on inner margin of first joint of endopod, while the terminal spines of both rami are considerably longer.

The telson (fig. 22, B) has the post-anal portion a little longer, the lateral serrations considerably larger, and the terminal and subterminal spines longer and stouter.

Length 3.8 mm. Type in South Australian Museum, Reg. No. C. 2676.

Ovirigerous female, C.—(slender form). In striking contrast to the robust variety, this differs from the type in the extremely elongate carapace, which is three times as long as deep, and twice as long as greatest width. The pseudorostrum is long, subtruncate in front, with the lobes meeting for a distance equal to about one-sixth of length of carapace. Antero-lateral angle with three teeth.

The basis of the first peraeopod is shorter than in the type, not quite half as long again as rest of limb; the basis of the second peraeopod, as in form B is likewise relatively shorter than in the type.

The lateral margins of the telson are distinctly serrate, and the terminal and lateral spines slender. In the uropods the armature is as in the type, but as in the much larger robust variety the exopod is two-thirds as long as the three-segmentate endopod; the latter has the longer terminal spine almost as long as the ramus.

Length 2.9 mm.

Adult male, C. Of the specimens here referred to *ambigua*, the only males belong to this small variety.

Carapace one-third of total length of animal and one-third as long again as pedigerous somites together; it is two and three-fourths times as long as deep and is a little wider than deep; seen from above it is only slightly broadened towards the rear, and viewed from the side the dorsal margin is little arched. Antero-lateral margin scarcely concave and antero-lateral angle with three small teeth. Pseudorostral lobes meeting for a distance equal to about one-fifth of length of carapace; the pseudorostrum is somewhat downbent. Ocular lobe not larger (relatively) than in female, slightly constricted at base.

Second and fourth somites markedly longer on back than the others; second well-produced anteriorly on sides, where its lobe generously overlaps first somite; third and fourth somites extended markedly backwards on sides, the second and third peraeopods separated by a wide interspace.

Pleon nearly half as long again as carapace; telson with rather long and slender apical and lateral spines and distinct serrations (fig. 23, tels.)

First antenna with flagellum three-segmentate and as long as last joint of peduncle; accessory lash small, apparently single-jointed. Second antenna with the eleven-segmentate flagellum more than half as long again as the slender peduncle.

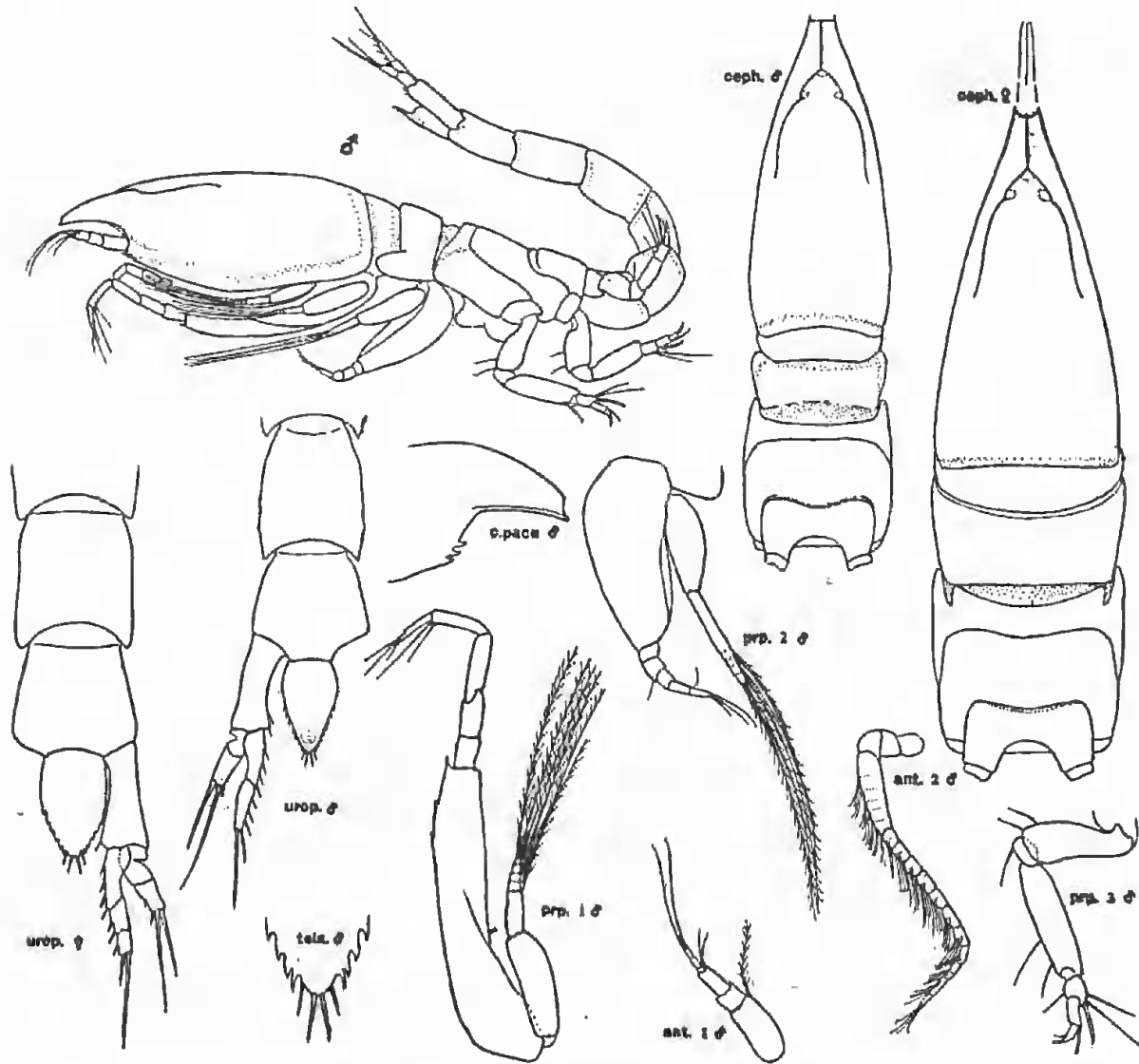


Fig. 23. *Gynodiastylis ambigua*, ovigerous female and adult male of small, slender form - C; lateral view of male and (ceph.) cephalothorax of both sexes from above ($\times 43$); c. pace, front of carapace ($\times 66$); ant., first and second antennae ($\times 66$); prp., first to third peraeopods ($\times 66$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 66$); tels., distal end of telson ($\times 200$).

First peraeopod with carpus barely exceeding the antennal angle; basis only one-third as long again as combined lengths of remaining joints, which are much as described for the type female.

Second peraeopod with exopod longer than basis, which is little more than twice as long as rest of limb; ischium relatively large but shorter than either merus or carpus, which in turn are shorter than either the subequal propodus or dactylus.

Third and fourth pereopods both without trace of exopods, and in other respects resembling those of female; the propodal seta is short.

Peduncle of uropod very slightly longer than telson and with two slender short spines near distal end of inner margin; endopod as long as peduncle, divided into two joints subequal in length (three-segmentate in all females), each with four spines on inner margin; exopod more than half, but less than two-thirds length of endopod.

Colour white. Length 2.5 mm.

Loc. New South Wales: Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Types in South Australian Museum, Reg. No. C. 2693-2694.

While this species in some respects resembles *laevis* (Calman, 1911, p. 371, pl. xxxv, fig. 32-39) the uropods and armed telson are very distinctive.

As the male is known only in the last of the three forms described and as the females resemble each other in the character of the appendages they are regarded provisionally as variants of one species. The differences between the robust (B) and attenuate (C) varieties, in both size and form, are, as mentioned, very striking.

GYNODIASTYLIS ATTENUATA sp. nov.

Adult male. Carapace completely smooth, almost one-third of total length of animal and as long as pedigerous somites and first pleon somite together; it is very slender, barely wider than deep, more than two and one-half times as long

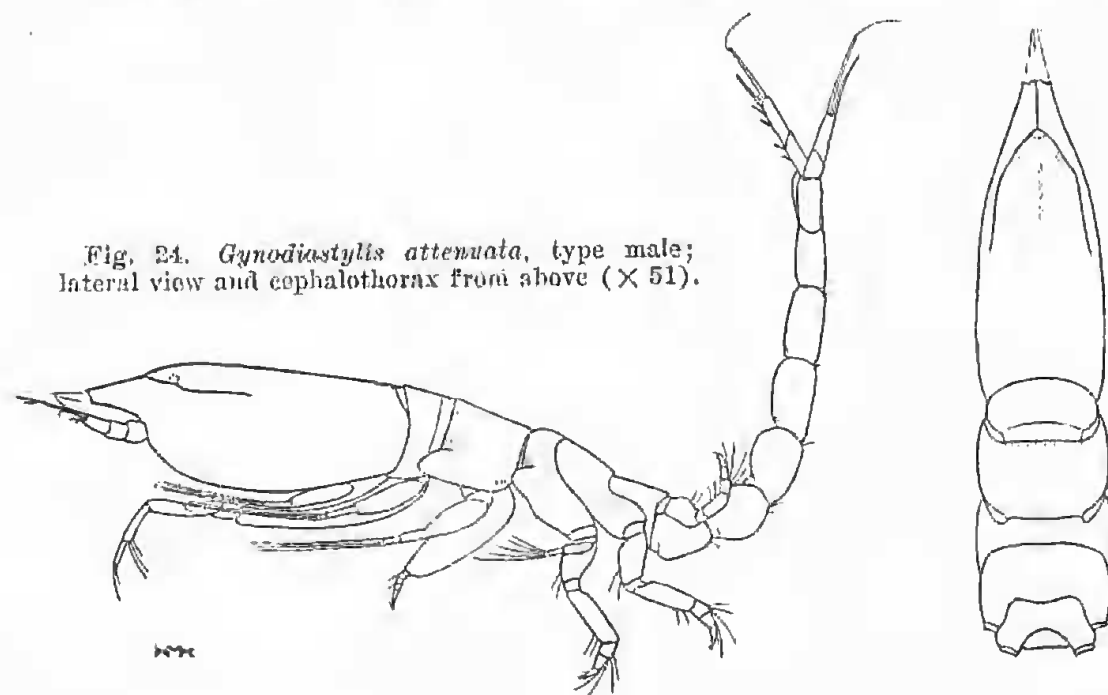


Fig. 24. *Gynodiastylis attenuata*, type male; lateral view and cephalothorax from above ($\times 51$).

as deep, and with dorsal margin from posterior end to ocular lobe, almost straight. Antero-lateral margin scarcely at all excavate and antennal angle rounded, without denticles. Pseudorostrum a little downbent, narrowly subtruncate in front both as seen from above and from the side, the lobes meeting for a distance equal to nearly one-fifth of total length of carapace. Frontal lobe with sutures distinct; eye-lobe subtriangular, longer than wide, with three faintly marked ocular areas.

Second pedigerous somite dorsally longer than any of the others, its anterior pleural lobes overlapping the first, which is relatively quite long; third and fourth somites decidedly produced backwards, the second and third peraeopods rather widely separated.

Pleon three-fourths as long as cephalothorax; fifth somite fully one-fourth as long again as sixth, which is slightly widened posteriorly, where it is quite as wide as long; telson plump, subcordate, shorter than sixth somite, with no post-anal portion and with no discernible terminal or lateral spines.

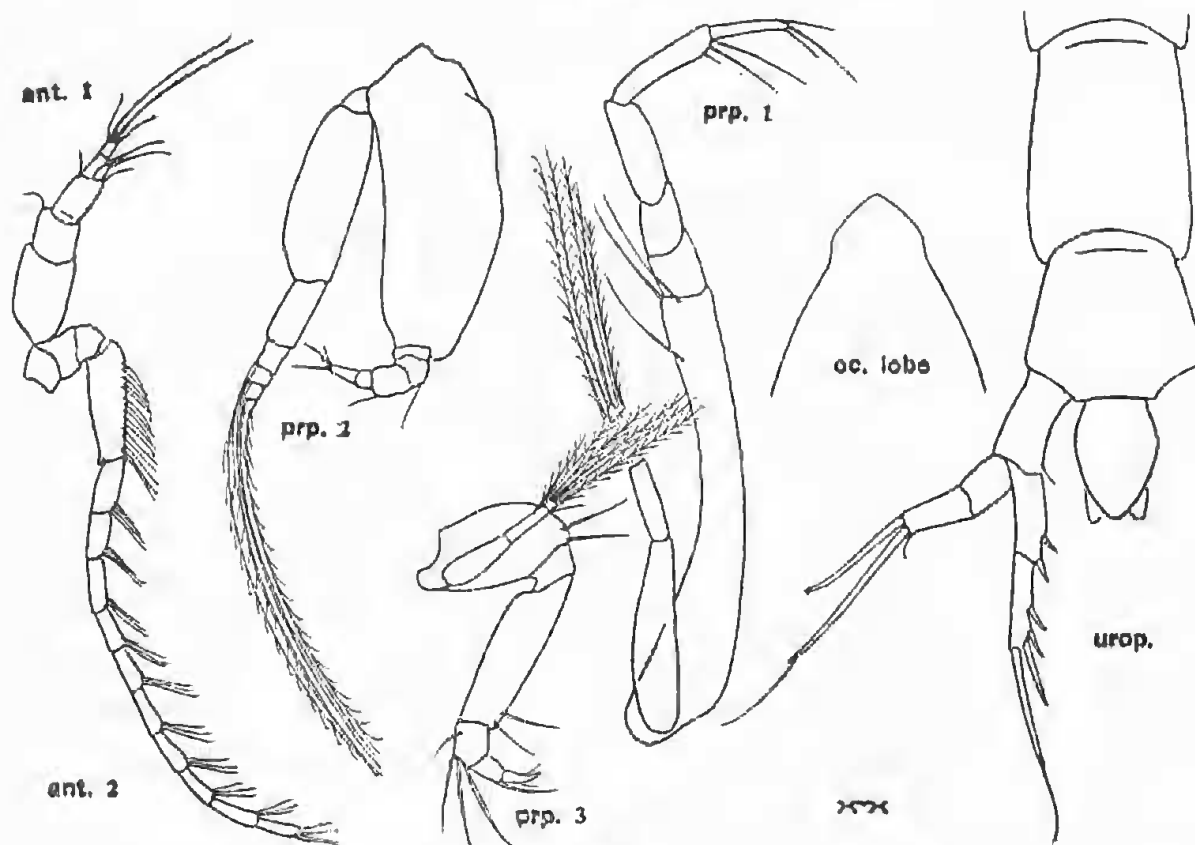


Fig. 25. *Gynodiastylis attenuata*, paratype male; oc. lobe, ocular lobe; ant., first and second antennae; prp., first to third peraeopods; urop., uropod with fifth and sixth pleon somites, and telson (all $\times 114$).

First antenna stout, with first joint of peduncle not much longer than second and third together; third joint little longer than second; flagellum two-jointed, as long as second joint of peduncle, and twice as long as the apparently single-jointed accessory lash. Second antenna shorter than carapace, slender, with relatively short peduncle and ten-jointed flagellum, which is fully twice as long as peduncle.

First peraeopod barely extending beyond level of apex of pseudorostrum when fully extended, the basis little longer than rest of limb; carpus about one-fourth length of basis, subequal in length to propodus, one-fourth as long again as dactylus, and equal in length to ischium and merus combined.

Second peraeopod with exopod fully as long as basis, which is broad and is two and one-half times as long as the abbreviated terminal joints together; ischium distinct, propodus much shorter than dactylus, and merus about as long as propodus and dactylus together.

Third peraeopod with short exopod, furnished with two-jointed flagellum and plumose setae; fourth leg without trace of exopod. These limbs are not much shorter than the second peraeopod; they have the merus more than twice as long as carpus and propodus together and the dactylus stout; the propodal seta and the most distal of the carpal setae reach beyond level of tip of dactylus. Fifth peraeopod about three-fourths as long as fourth.

Peduncle of uropod not quite as long as telson or as exopod, which is three-fifths as long as the endopod; exopod with two stout, subequal spines (composite setae) the longer, not including the slender terminal portion, as long as endopod; first segment of the two-jointed endopod subequal in length to second, and with two inner spines; second joint with three inner spines, successively increasing in length, and with a terminal spine which (excluding its slender setal portion) is two-thirds as long as the ramus.

Length 2.3 mm.

Ovigerous female. The available material of this species was preserved in formalin. A couple of females with marsupium, though completely decalcified, show that in form this sex differs little from the male as figured and has the same attenuated facies. As usual in the genus exopods are well developed on the first and second peraeopods, but are absent on the third maxilliped and third and fourth peraeopods. The second and third peraeopods are more widely separated than in the male.

The endopod of the uropod is two-jointed.

Length 2.5 mm.

Loc. Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, Stations 28, 44, and 55, 50 cm. 40 m. net, 2.30 a.m. and 9.30 p.m. on Nov. 29, 1940, and 9.40 p.m. on Dec. 6, 1940). Types in South Australian Museum, Reg. No. C. 2678 and 2680.

This species in general appearance closely resembles the small variety (C) described under *ambigua*, but may be at once distinguished by the unarmed telson, the difference in the uropods, and the absence of teeth at the antennal angle. It is also very much like the New Zealand *laevis* (Calman, 1911, p. 371, pl. xxxv, fig. 32-39), but that form has the endopod of the uropod unsegmented and only a little longer than the exopod, there is no exopod on the third peraeopod of the male, the joints of the second peraeopod are of different proportions, etc.

GYNODIASTYLIS ECHINATA sp. nov.

Ovigerous female. Integument calcified, opaque, but fragile and easily fractured.

Carapace one-third of total length of animal and two-thirds as long again as pedigerous somites together; it is robust, less than half as long again as deep, its depth not quite equal to greatest width, which is at posterior end; back and sides strongly spinose, the spines more or less distinctly arranged in series, particularly those margining a furrow which curves upwards from antero-lateral angle towards dorsum, longitudinal rows on each side of a dorsal gutter, and along infero-lateral fold; on the back and dorso-laterally there are numerous plumose hairs between the armature. Antero-lateral margin short, deeply excavate; antero-lateral angle armed with a spine (one of a series running back from it). Pseudo-rostrum distally acute as seen from the side, excavate when viewed from above; lobes meeting for a distance equal to fully one-tenth of length of carapace. Sutures fused, so that the whole frontal lobe is not well defined. The ocular lobe is much wider than long, and eyes are not defined, although there is a translucent area on each side of the lobe.

Pedigerous somites spinose, the spines largest on dorsum, where a dorso-lateral, slightly elevated row occur on each side of second to fifth; plumose hairs as on carapace; first and third somites shorter dorsally than the others; pleural parts of second and third produced forwards, those of third to fifth backwards.

Pleon as long as cephalothorax, sparsely spinulose dorso-laterally and ventrally, with spinules on sides (see fig. 26), and with plumose setae on venter; somites stout and rather short, the fifth not much longer than sixth, which is somewhat wider than long; telson longer than any other of the pleon somites, subcylindrical, but with a short, tapering, post-anal portion armed with two small terminal spines (fig. 27, tels.).

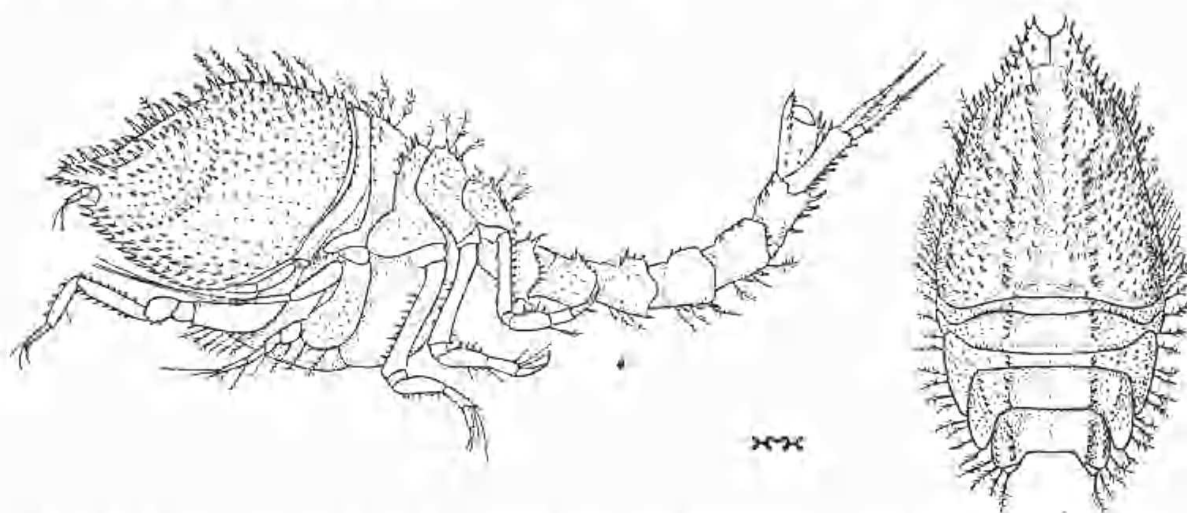


Fig. 26. *Gynodiastylis echinata*, type female; lateral view and cephalothorax from above ($\times 27$).

First and second peduncular joints of the short first antenna armed with spines; first joint stout, nearly as long as rest of peduncle and flagellum together; third joint twice as long as second, and equal in length to the two-jointed main flagellum; accessory flagellum very small.

Second antenna three (?) jointed, spinose.

Mandible with about ten spines.

Third maxilliped with basis to carpus spinulose; basis stout, about as long as remainder of limb and with apex not dilated, but a little forwardly produced at outer distal angle; propodus a little longer than either merus, carpus or dactylus, which are subequal in length.

All peraeopods spiny. First pair short, the carpus barely reaching level of antennal angle; basis wide, about two-thirds as long as rest of limb; carpus twice as long as merus, and only about one-fourth as long again as the long propodus, which bears a single long distal seta; dactylus about half as long as propodus, with a terminal brush of setae, one stouter than the others.

Basis of second peraeopod large, as long as remainder of limb; ischium suppressed; merus, carpus and propodus subequal in length, each only about three-fourths as long as dactylus, the longest terminal seta of which is as long as propodus and dactylus together.

Basis slender in third to fifth peraeopods, as long, or almost as long, as remaining joints together in third and fourth, shorter in fifth; merus not as long as carpus and propodus together and less than half as long as basis in all; apart from length of basis these limbs differ little in size.

Peduncle of uropod stout, spiny, reaching only to posterior ends of anal valves, with strong non-articulate spines on outer face; rami spiny, the exopod as long as peduncle and with longest of the three very unequal terminal spines not quite as long as the ramus; endopod three-jointed, the first joint half as long again

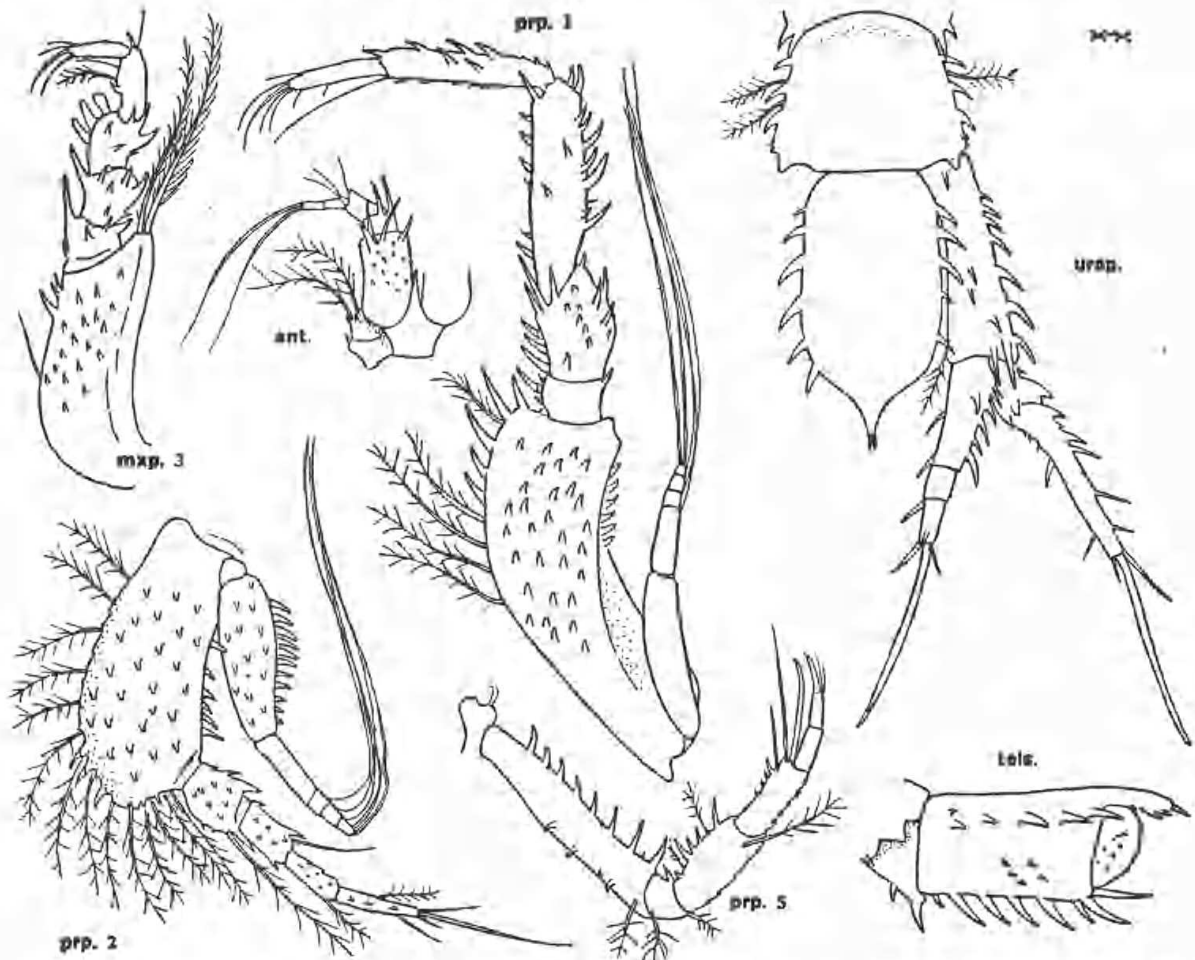


Fig. 27. *Gynodiastylis echinata*, type female; ant., first and second antennae; mxp. and prp., third maxilliped, and first, second and fifth peraeopods; urop., uropod with sixth pleon somite and telson; tels., lateral view of telson (all $\times 70$).

as second and third segments together; second joint somewhat shorter than third, the longest terminal spine of which is as long as the whole ramus.

Colour milk-white. Length 3.3 mm.

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt (K. Sheard, Oct., 1943). Type in South Australian Museum, Reg. No. C. 2652.

GYNODIASTYLIS ROSCIDA sp. nov.

Female with developing marsupium. Integument calcified, but not very thick; carapace, excepting along posterior and lower margins, covered with closely set glassy granules.

Carapace large and robust, more than one-third of total length of animal; it is subovate as seen from above, as broad as deep and only one-third as long again as wide; dorsally there is a pair of widely separated longitudinal ridges in posterior half, the back between them sulcate; anteriorly, on and behind frontal lobe, there is another pair placed much closer together, and in front of ocular

lobe these continue to the apex of the pseudorostral lobes; on each side of frontal lobe there is a slight excavation, margined by a faint dorso-lateral curved ridge, conspicuous mainly because of its line of rather pointed granules, which run from the end of each of the aforementioned posterior carinae towards the front of pseudorostrum; each side has a shallow depression, not emphasized by any trace of ridges or folds, and below it the lower part of carapace is rounded, the inferior margin incurved. Antero-lateral margin shallowly concave, and antennal angle rounded, granulate. Pseudorostral lobes pointed in front, meeting for a distance equal to nearly one-fifth of length of carapace. Frontal lobe obscurely defined; ocular lobe wide, with no apparent eyes.

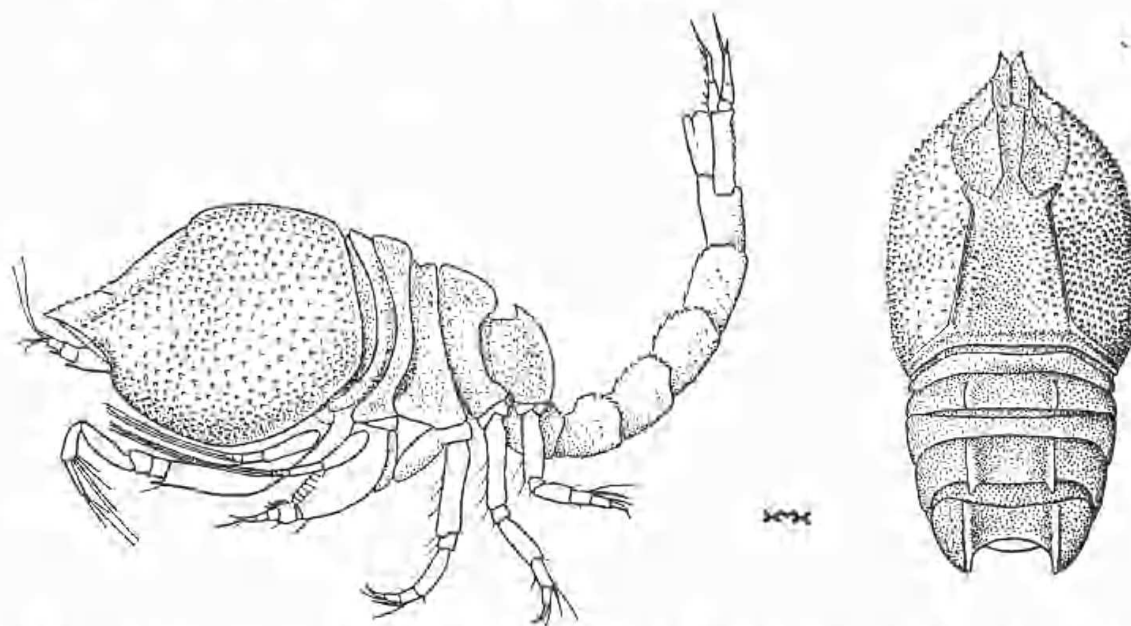


Fig. 28. *Gynodiastylis roscida*, type female; lateral view and cephalothorax from above ($\times 30$).

Pedigerous somites together about two-thirds as long as carapace, the pleural parts of all exposed; second and third not greatly expanded on sides, but pleural portions probably more produced in adult; second, fourth, and fifth somites each with a pair of strong dorso-lateral carinae, those of the last two somites particularly strongly elevated, almost cristiform; there is some sparse granulation.

Pleon twice as long as pedigerous somites together, and thus considerably shorter than cephalothorax; on each side of the first to fifth somites there is a low dorso-lateral, longitudinal serrated crest, directed outward and so most prominent when the animal is viewed from above (fig. 29, urop); sixth somite a little wider than long, not very conspicuously shorter than fifth, and with traces of serrated crests only near anterior end; telson broadly ovate, plump, without any post-anal part, without spines, but with a few serrations on sides near apex, which bears two pairs of insignificant bristles.

First antenna robust; proximal segment of peduncle longer than second and third joints together, with a strong distal tooth; second and third subequal in length, but second much the wider and with two spine-like distal teeth; the short flagellum is two-jointed, the accessory (which is about half as long as the main lash) two-jointed with possibly a small third basal segment. Only three joints can be made out in the second antenna, which is tiny.

Mandibles with ten and eleven spines.

Third maxilliped with basis granulate, a little longer than rest of appendage, with inner margin strongly toothed and a prominent tooth at inner apical angle; external distal angle not much produced, with one of the setae much stouter than the others.

Developing marsupial plates and at least basis of peraeopods studded with granules, which become very small on posterior legs.

First peraeopod short, the carpus reaching little beyond antennal angle, the whole limb not much longer than carapace; with basis equal in length to remaining joints together, in part serrate on both margins and with some conspicuous

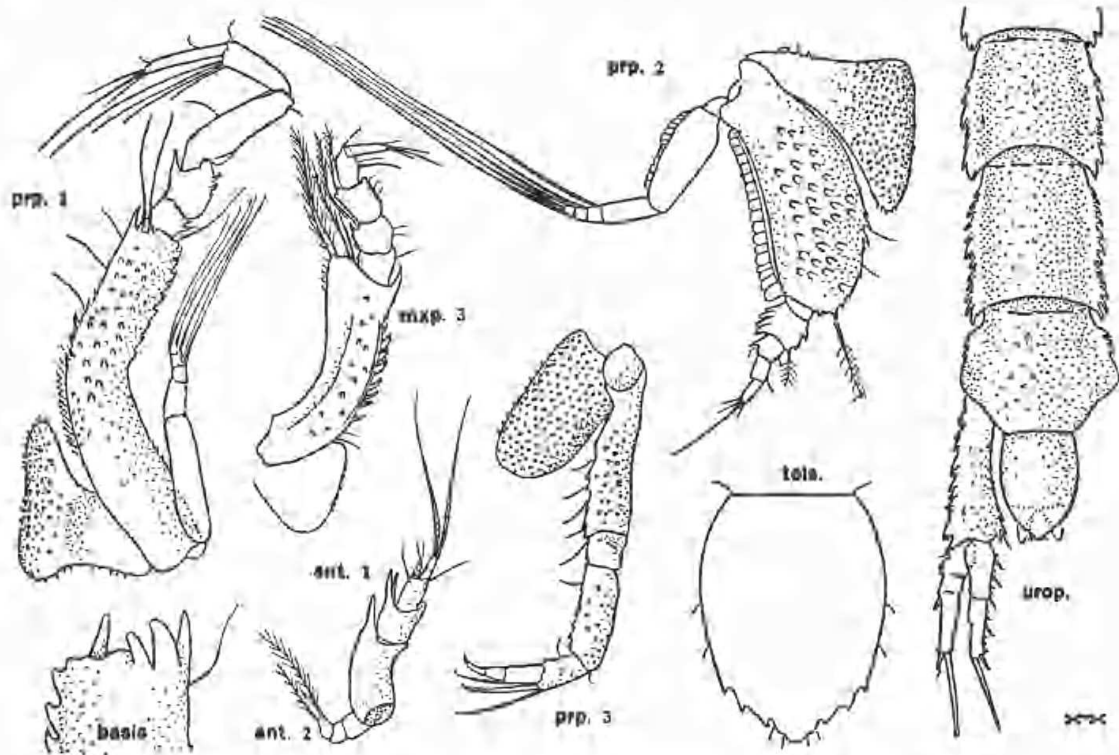


Fig. 29. *Gynodiastylis roseida*, type female; ant., first and second antennae ($\times 55$); mxp., and prp., third maxilliped and first to third peraeopods ($\times 55$); basis, distal end of basis of first peraeopod ($\times 125$); urop., uropod with fourth to sixth pleon somites and telson ($\times 55$); tels., telson ($\times 125$).

teeth at distal end; propodus rather less than two-thirds as long as carpus, as long as ischium and merus combined, and with four unequal distal setae, the longest more than twice as long as the joint; dactylus barely longer than propodus with one of its distal setae very long; ischium and merus spiny.

Second peraeopod only half as long as first, with the wide basis quite twice as long as remaining joints together and with a comb of flattened spines on inner edge; ischium distinct; merus broad, its width emphasized by four flattened crowded teeth on inner margin and a couple of less prominent teeth on outer; carpus a little shorter than merus, subequal in length to propodus and with an inner tooth; dactylus little longer than propodus, with one of the distal setae very long; exopod, including its setae, much longer than the limb.

Third and fourth peraeopods with basis much shorter than rest of limb, and merus distinctly longer than carpus and propodus together; one of the two distal carpal setae much stouter and a little shorter than the other which, like the slender propodal seta, reaches to tip of the rather short, curved, and pointed dactylus. Fifth peraeopod shorter than third or fourth leg, but as long as second.

Peduncle of uropod dilated distally, jaggedly serrate on both margins, but without articulated spines; it is a little longer than the telson and than the subequal rami; endopod divided into two joints of equal length, the first with three inner spines and some spinules, the second with two spines on inner margin, and a terminal spine less than two-thirds the length of the ramus; exopod with a few serrations on outer edge near proximal end and with the longer of the two very unequal terminal spines barely longer than that of endopod.

Colour: carapace and pedigerous somites pale russet brown; pleon and appendages cream. Length 3 mm.

Loc. Tasmania: Marion Bay, 10-17 fath., amongst kelp (W. S. Fairbridge, Euphausiid bottom net, Dec., 1944). Type in South Australian Museum, Reg. No. C. 2744.

Resembles *quadricristata* in some respects, but is readily distinguished by the sculpture.

GYNODIASTYLIS MUTABILIS sp. nov.

Female with brood young. Carapace deep and somewhat compressed, one-third of total length of animal, and less than half as long again as pedigerous somites together; it is only about half as long again as deep, but two-thirds as long again as greatest width; seen from the side the dorsal margin inclines slightly upwards from rear end to above posterior end of frontal lobe, thence descends steeply and obliquely to apex of pseudorostrum; each side of frontal lobe with a depression partly enclosed by a low serrate ridge; each pseudorostral lobe has a dorsal carina running from apex to frontal lobe and then continued for a short distance on the latter; on each side a fine dorso-lateral ridge (with some posterior denticles) curves up from front of pseudorostrum towards the frontal ridge, and a longer transverse carina curves back from antennal angle and then forward to meet the ridge of frontal lobe; in addition to these carinae, which are all very fine, there are a number of short irregular ill-defined longitudinal ridges and some shallow pits on the sides; the median part of the dorsum, from frontal lobe to hinder margin, is depressed, the rather wide sulcus margined by a low longitudinal fold on each side. Antero-lateral margin scarcely excavate; antero-lateral angle obtuse but with a tooth, behind which inferior margin is serrate for a short distance. Pseudorostrum subtruncate and excavate in front, the lobes meeting for a distance equal to about one-seventh of length of carapace. Ocular lobe excessively short, the front margin almost transverse; it is armed with a pair of tiny denticles and is rounded at the lateral corners; no apparent lenses.

First, and particularly third, pedigerous somites dorsally much shorter than any of the others; the third is expanded fore and aft on the sides, and the second and third peraeopods are widely separated; evidently but for the distended brood pouch the anterior pleural lobe of second would overlap the first somite and that of third the posterior part of sides of second; fourth and fifth each with a clear cut dorso-lateral longitudinal carina on each side.

Pleon not quite as long as cephalothorax, the distal somites subcylindrical and rather slender; fifth somite less than one-fourth longer than sixth, which is barely dilated posteriorly where it is not as wide as long; telson equal in length to sixth somite, with nearly one-fifth of length post-anal; sides subparallel almost to level of end of anal valves and with three small lateral teeth, the last pair more prominent than the others; the part distal to the last dentations tapers abruptly to the acute apex, and bears a pair of subapical spines.

First antenna very stout; first segment of peduncle much longer than whole of rest of appendage and, like the short and wide second joint, armed with strong

spine-like projections at distal end; third joint partly concealed by the aforementioned spines; flagellum short, two-segmentate, the accessory lash about half its length and apparently three-jointed. Second antenna three-jointed.

Mandible with about thirteen spines in the row.

Third maxilliped with basis robust, more than half as long as remaining joints together, the distal half of inner margin, like inner edges of ischium, merus and carpus, with closed serrations.

First peraeopod with distal portion missing.

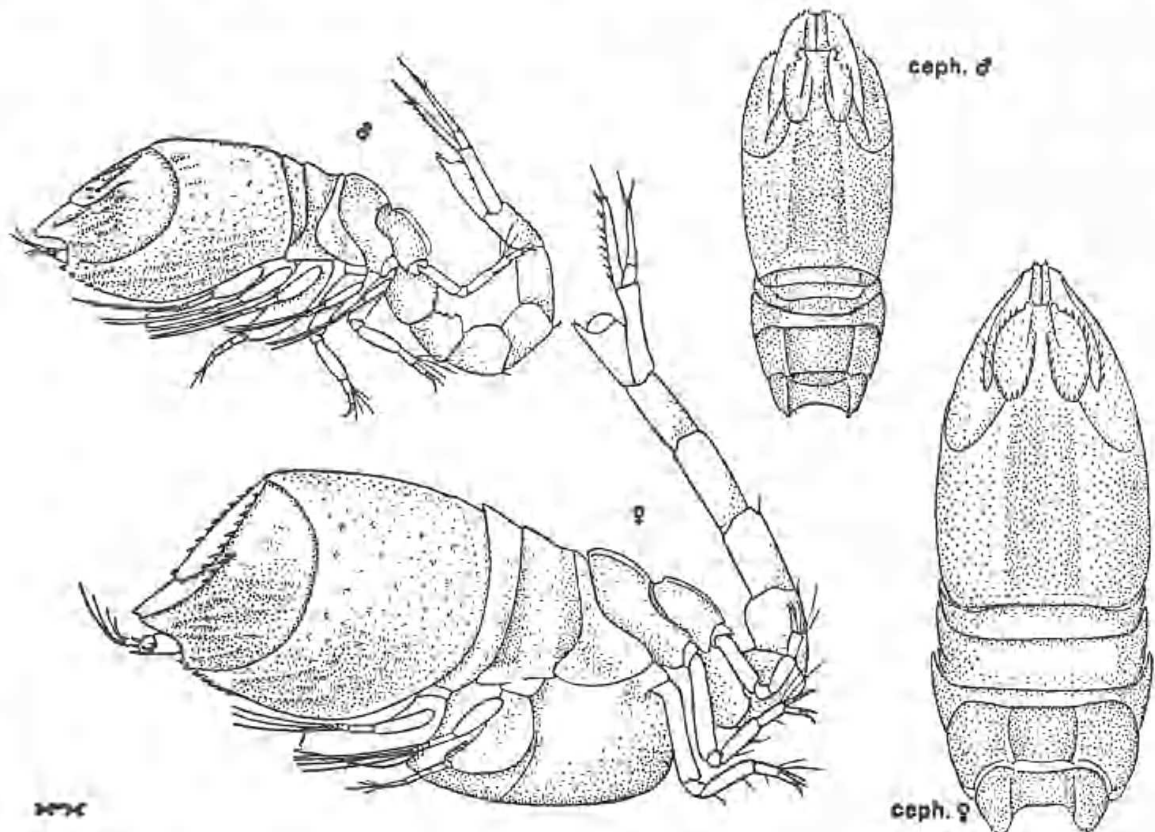


Fig. 30. *Gynodiastylis mutabilis*, types female and male; lateral view and cephalothorax from above ($\times 30$).

Second peraeopod with exopod as long as the wide basis, which is considerably longer than the slender remaining joints together; ischium short but distinct; carpus a little longer than either merus or propodus, the latter barely more than half as long as dactylus.

Third and fourth peraeopods with basis about two-thirds as long as rest of limb, and merus not a great deal longer than combined length of carpus and propodus; carpus with last distal seta stouter and shorter than penultimate and, like stout propodal seta, reaching to about level of apex of the claw-like dactylus. Fifth peraeopod a little shorter than fourth and almost as long as second.

Peduncle of uropod unarmed, barely longer than telson, and equal in length to exopod, which is not quite as long as the single-jointed endopod; the last-named bears seven spines on inner margin and two unequal terminal spines, the longer less than half length of ramus, and subequal in length to the longer of the apical spines of exopod.

Length 3 mm.

Adult male. Resembles the female in general form, but carapace not so deep and dorsal ridges less markedly serrate.

Carapace little deeper than wide and two-thirds as long again as deep; it is one-third of total length of animal and three-fourths as long again as pedigerous somites together. Antero-lateral margin not sloping back as in female and antero-lateral corner dentate. Pseudorostrum, as seen from above, relatively broader than in female, and ocular lobe a little broader but again very short and without eyes.

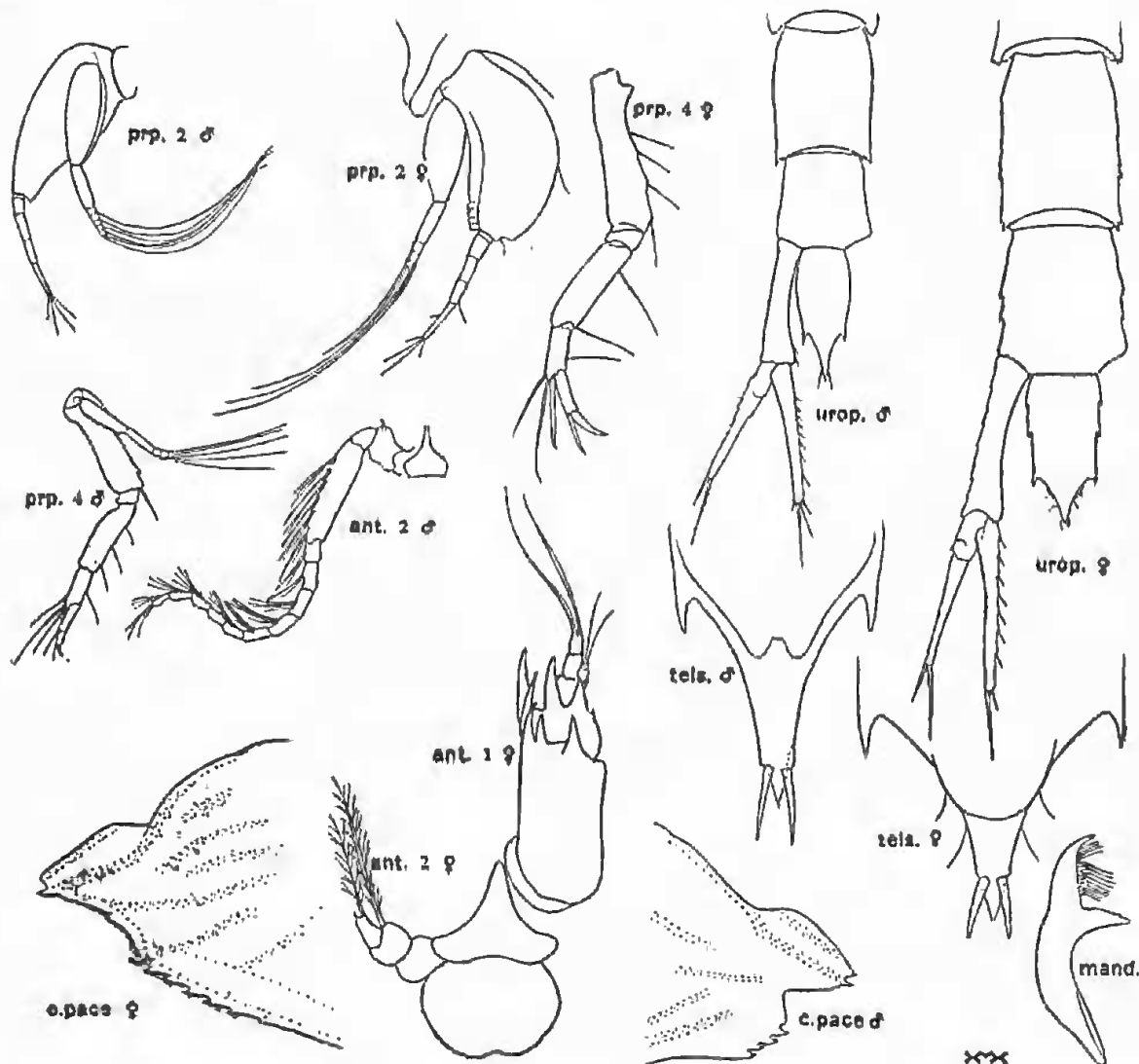


Fig. 31. *Gynodiastylis mutabilis*, types female and male; c. pace, anterior portion of carapace, slightly flattened ($\times 52$); ant., antennae and lips (male, $\times 52$; female, $\times 135$); mand., mandible ($\times 52$); prp., second and fourth pereopods ($\times 52$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 52$); tels., ventral views of distal portion of telson ($\times 210$).

Anterior pedigerous somites crowded; second with anterior pleural part overlapping first to carapace; third very short dorsally, expanded on sides, but second and third legs not separated more than others.

Pleon not quite as long as cephalothorax and with sides smoother than in female; the telson is narrower and longer (longer than sixth somite), with the distal part quite slender, and there is only one tooth on each lateral margin; the single pair of spines are subterminal and the apex tapers to a point.

Second antenna with the ten-segmentate flagellum not much longer than the peduncle. Upper lip narrower than in female.

Second pereopod with basis much longer than rest of limb and with dactylus less than twice as long as propodus.

Third and fourth pereopods both with exopods, which are only about two-thirds as long as those of first and second legs, but which bear long plumose setae; distal carpal seta and propodal seta more slender than in female.

Peduncle of uropod not quite as long as telson and with a short bristle and spine near distal end of inner edge; rami as in female but a couple of extra spines on endopod.

Colour white. Length 2.63 mm.

Loc. New South Wales: Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Types in South Australian Museum, Reg. No. C. 2692 and 2714.

The female described above is quite transparent, the embryos easily visible through the marsupial plates. The male, although small, seems to be mature, for the second antennae bear dense sensory setae and the exopods of the third and fourth legs have the flagellar setae long.

It may be said of the adults of this species that the telson tapers to an acute point without apical spines, the character by which Calman separates his *Oxyurostylis* from *Diastylis* (see Calman, 1912, p. 666 and Zimmer, 1936, p. 437). In *G. mutabilis*, however, the condition results from a prolongation of the apex of the telson over and beyond the bases of what normally would be the terminal spines (see tels. in fig. 32) whereas in *Oxyurostylis* the last of the pairs of spines are truly lateral, which does suggest a suppression of the terminal spines combined with a narrowing of the apex. In the male of *Paradiastylis culicoides* Kemp (1916, p. 398, fig. 5) there is a median, spine-like posterior prolongation of the telson.

In addition to the above specimens, there is before me a young female, with fifth legs as yet quite undeveloped, and which I think belongs without doubt to this species. This example, however, exhibits some interesting differences and is therefore described and figured in some detail.

Juvenile female. Integument calcified, but thin and brittle.

Carapace not quite one-third of total length of animal and twice as long as pedigerous somites together; it is robust, deeper than wide and less than half as long again as deep; dorso-lateral ridge on each side armed with two or three denticles and dorsal longitudinal carina on each pseudorostral lobe faint; frontal lobe with a concavity on each side, the space between with two pairs of teeth; posterior to the frontal lobe is a pair of longitudinal dentate carinae; sides smooth excepting for large pits arranged as shown in figure, one series forming a curved line from posterior end of frontal lobe to antero-lateral portion of carapace; antero-lateral margin widely rounded and strongly dentate, fig. 31, c. pace); a small but distinct antennal notch. Pseudorostral lobes irregularly subtruncate in front, the distal ends of the aforementioned carinae projecting as small points; meeting for a distance equal to about one-sixth length of carapace. Ocular lobe wide and extremely short, armed with a tiny tooth on each side and without apparent lenses.

First three pedigerous somites short and crowded dorsally; second moderately expanded fore and aft, and the third pereopods not widely separated; second and fourth with a pair of dorsal spines, third somite with two obsolete spines.

First five pleon somites armed with dorso-lateral teeth, and each with a median ridge on underside, flanked at posterior margin by a pair of curved, almost spine-

like setae; infero-lateral corners of these somites armed with a tooth, below which is a smaller tooth; sixth somite almost as long as fifth, dilated at hinder end, where it is distinctly wider than long, and nearly twice as broad as deep; the somite is

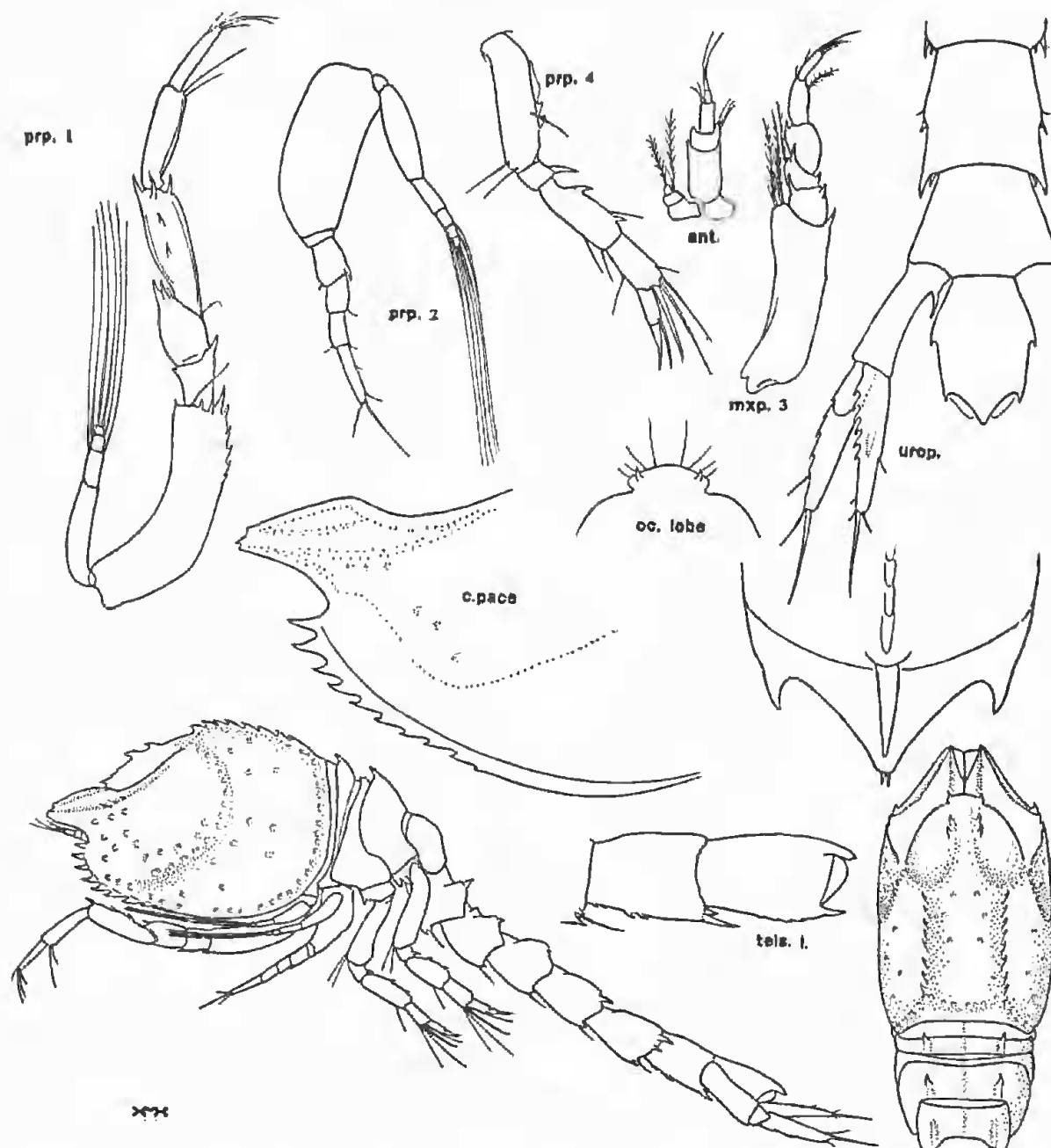


Fig. 32. *Gynodiastylis mutabilis*, juvenile female; bottom, lateral view of whole animal and cephalothorax from above ($\times 38$); oc. lobe and c. pace, ocular lobe and anterior part of carapace ($\times 72$); ant., first and second antennae ($\times 72$); mxp. and prp., third maxilliped, and first, second and fourth pereopods ($\times 72$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 72$); tels. 1., telson and sixth pleon somite from the side ($\times 72$); tels. v., ventral view of distal end of telson ($\times 250$).

dentate-carinate inferiorly, the ridge terminating posteriorly in a strong spine, on each side of which is a similar projection about half the length of the median spine; telson a little longer than any other of the pleon somites, with two tooth-like projections on each side and with a short post-anal part, furnished with two tiny terminal spines; on the underside there is a longitudinal median ridge

projecting posteriorly as a strong spine which reaches almost to level of apex of telson.

First antenna short and robust; first joint of peduncle longer than second and third together. Second antenna three-jointed.

Third maxilliped with basis little longer than rest of limb, with an inner tooth at distal end; ischium, merus and carpus with distal teeth.

First pereopod rather short, the propodus not reaching much beyond level of apex of pseudorostrum; basis distally dentate, little more than half as long as rest of limb; ischium with a spine at inner distal angle; merus armed with outer distal spines, and carpus dentate at distal end and laterally; propodus three-fourths as long as merus, with only two not very long distal setae; dactylus more than two-thirds length of propodus, with terminal setae shorter than the joint.

Second pereopod with exopod as long as basis, which is barely shorter than rest of limb; ischium distinct; merus armed with distal teeth, slightly longer than either carpus or propodus, which are subequal in length; dactylus three-fourths as long again as propodus, with slender distal setae, one of which is fully as long as the joint.

Third and fourth pereopods about equal in size; coxa, basis, ischium and merus with teeth, one on outer face of ischium and two on merus being prominent; merus equal in length to carpus and propodus together or barely longer; fifth legs absent.

Peduncle of uropod subequal in length to fifth pleon somite (longer than telson) with an inner tooth near proximal end; rami subequal in length, the endopod single-jointed and not longer than exopod, which is one-third as long again as peduncle; in both rami the outer margin is serrate and the endopod bears a tooth on outer face; the articulated marginal spines are feeble, and the slender terminal spines are much shorter than the rami.

Colour white. Length 2-4 mm.

Loc. New South Wales: 11 miles off Eden, 120 metres (K. Sheard, A. Trawl, Jan., 1943).

GYNODIASTYLIS ORNATA sp. nov.

Female with developing marsupium. Integument thin, but calcified and brittle, with a few scattered granules.

Carapace more than one-third of total length and nearly twice as long as pedigerous somites together; its greatest depth about two-thirds of length which is almost twice the width; seen from above it is (apart from pseudorostrum) subrectangular in shape, with the antero-lateral margins rounded; on each side a serrate dorso-lateral ridge curves forward from about middle of length; behind these ridges the dorsum is concave almost to hinder margin of carapace, the depression defined by a low ridge on each side; from near posterior limits of dorso-lateral ridges a low and rather broken ridge curves downwards and forwards on each side to the neighbourhood of antero-lateral angle of carapace and marks the hinder and lower limits of a depression; posterior half of sides with large reticulations, the longitudinal edges running together to form incipient ridges. Antero-lateral margin short, shallowly concave; antero-lateral angle subacute and margin behind it serrate for a short distance. Pseudorostrum subacute in front, meeting in front of ocular lobe for a distance equal to fully one-fifth of length of carapace. Frontal lobe sutures fused; ocular lobe rounded, wider than long, with a pair of spinules and three obscure corneal lenses.

Pedigerous somites each with a pair of low dorso-lateral ridges and with a few short plumose setae; first somite almost as long as second; the latter is longer

dorsally than third, the pleural parts of which are well expanded fore and aft, overlapping the second and hinder edge of first in front; second and third legs not widely separated.

Pleon a little shorter than cephalothorax; second to fourth and sixth somites each subequal in length to the telson; fifth but little longer, and sixth not wider than long; telson plump, suboval in shape, without post-anal portion and with apical spines minute.

First joint of peduncle of first antenna longer than second and third joints plus flagellum; first and second with a distal spine, second and third subequal in length; flagella two-jointed, the accessory as long as first joint of main lash.

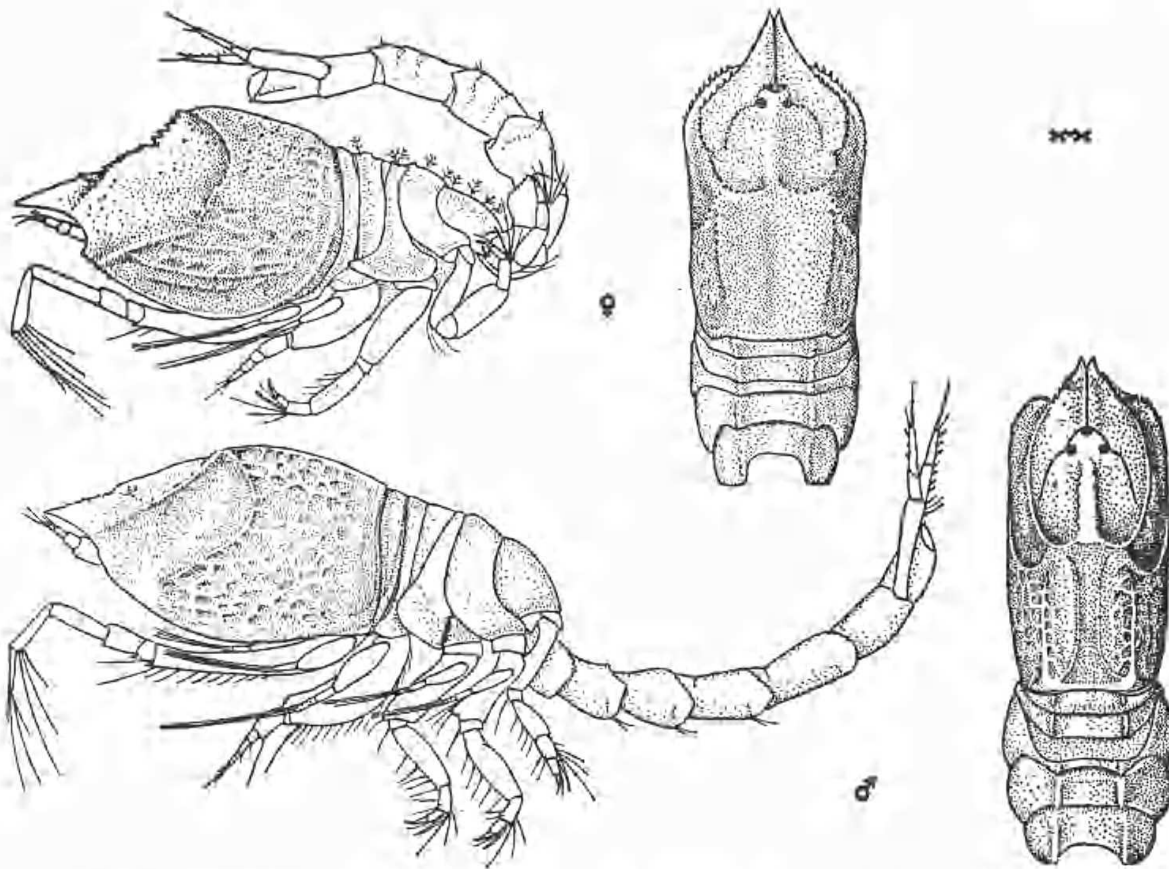


Fig. 33. *Gynodiastylis ornata*, types female and male; lateral views and cephalothorax from above ($\times 25$).

Basis of third maxilliped elongate, half as long again as rest of limb and with a long row of stout plumose setae on inner margin and inner distal angle acute; remaining joints all subequal in length; ischium and merus each with an inner tooth, merus with two projections on inner margin and a small tooth on outer.

First pereopod with carpus not quite attaining level of apex of pseudo-rostrum; basis almost as long as rest of limb, serrate on inner, outer and distal edges and with a row of plumose inner setae; ischium and merus dentate; propodus five-sixths as long as carpus, and as ischium and merus together, with three inner subdistal setae, the longest of which is twice as long as the joint; dactylus five-sixths as long as propodus, its terminal setae long.

Second peraeopod with the wide basis longer than rest of limb and with margins more or less serrate, and with plumose setae as shown, one seta long; merus wide, together with the short but distinct ischium as long as carpus, propodus and dactylus together, with dentate margins and with a long distal plumose seta; carpus a little shorter than propodus which is almost as long as dactylus.

Third to fifth peraeopods stout; merus of third and fourth about three-fourths as long as carpus and propodus together, in fifth leg equal in length to these joints combined; carpus with a stout inner distal seta reaching level of tip of dactylus, preceded by three more slender setae, the longest of which extends well beyond apex of dactylus.

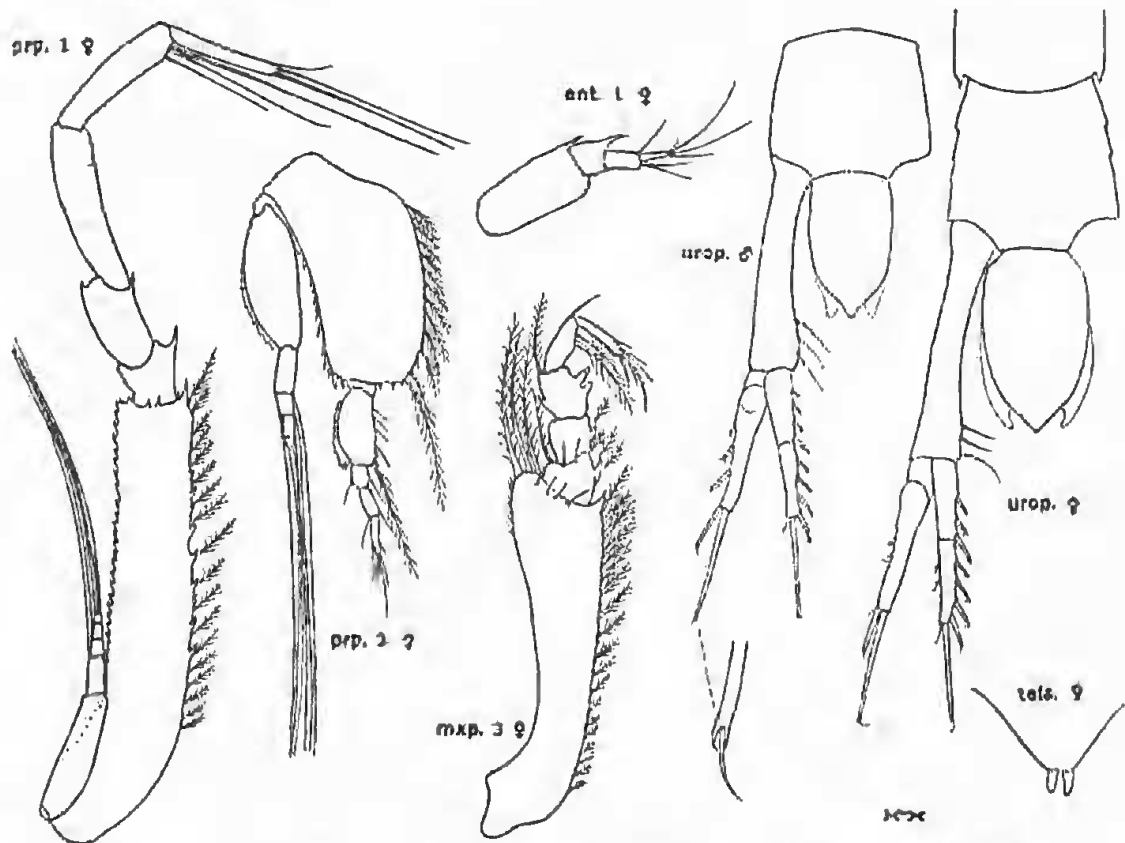


Fig. 34. *Gynodiastyle ornata*, type male and paratype female; ant., mxp. and prp., first antenna, third maxilliped, and first and second peraeopods ($\times 50$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 50$); spine and distal end of telson, ($\times 250$).

Uropod with peduncle one-third as long again as telson and with three inner setae near distal end; rami subequal in length, each more than two-thirds the length of peduncle; endopod composed of two joints of equal length, and with three and four inner spines; terminal spine more than half as long as ramus, flanked on outer side by a bristle; exopod with two or three short spines on outer margin and with two terminal spines, one less than half as long as the other, which is more than two-thirds as long as the ramus.

Colour white. Length 3.8 mm.

Adult male. The differences in the shape of the carapace and in the pedigerous somites are shown in the figures. Although the sculpture is on the whole more clearly defined, the dorso-lateral ridge is not serrate (feebly crenulate); the depression in posterior half of back has a central median trough margined by a carina on each side, while the low longitudinal elevation on and behind frontal

lobe is well marked and has the edges rugose, almost tuberculate. The frontal lobe suture is distinct, as are also the corneal lenses. The antero-lateral margin is less concave and the antero-lateral "angle" rounded and serrate.

Peduncle of uropod half as long again as telson; rami as in female, save for an extra inner spine on first joint of endopod.

Length 4 mm.

Loc. Tasmania: off Babel Island, 0-50 metres (type male, "Warreen" Station 29, Jan., 1939). New South Wales: 5 miles off Eden, 60 metres, on mud (type female, K. Sheard, submarine light, Dec., 1943); Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Types in South Australian Museum, Reg. No. C. 2337 and 2688.

The type male, which is illustrated, has clear-cut large reticulations on the hinder part of the sides, but in another male (Brush Island) the edges run together to form irregular ridges as noted for the female. Evidently the somewhat irregular carinae consistently found in this situation in such species as *costata*, *turgida* and *lata* are so derived.

GYNODIASTYLIS STRUMOSA sp. nov.

Ovigerous female. Integument moderately calcified and brittle; the surface, apart from the major tumidities, is slightly irregular and finely granulate; with scattered pellucid spots on thorax and most of pleon, while in certain lighting there is an effect of short irregular raised lines on carapace.

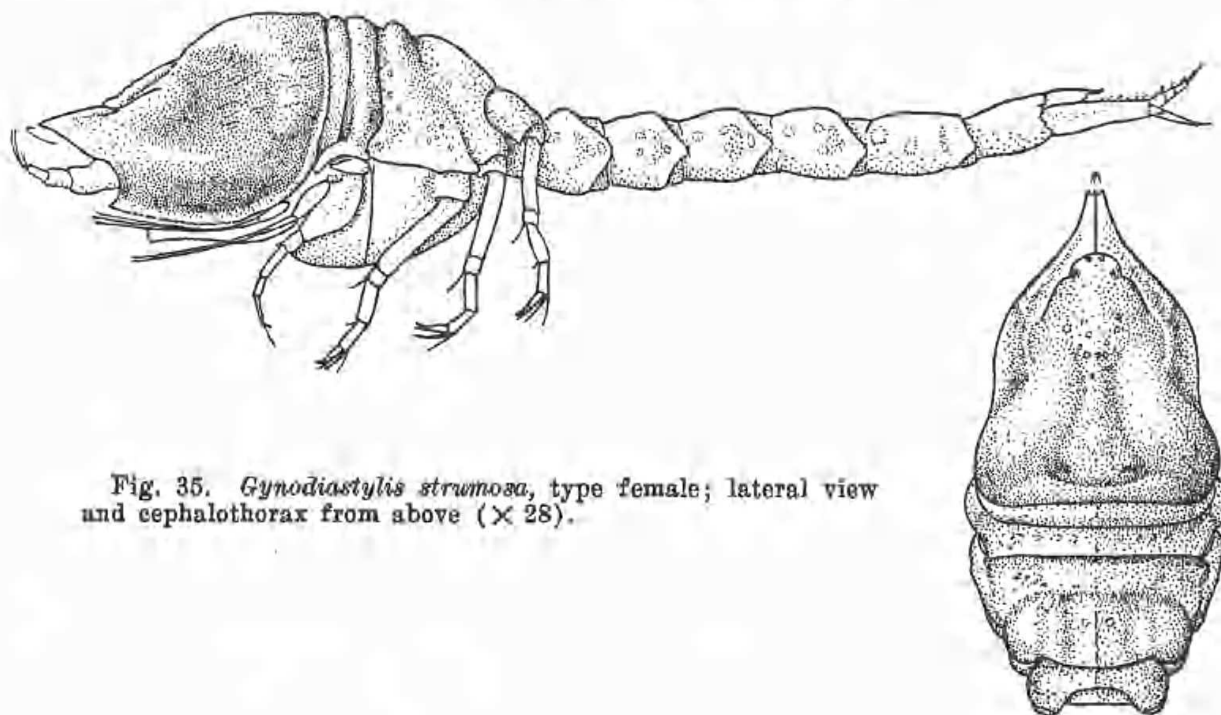


Fig. 35. *Gynodiastylis strumosa*, type female; lateral view and cephalothorax from above ($\times 28$).

Carapace relatively small, not quite two-sevenths of total length of animal and as long as pedigerous somites and first pleon somite together; it is half as long again as deep, somewhat depressed and widest across branchial regions, which are considerably inflated; there is a tumidity on each side below the frontal lobe, the surface of which is rounded and slightly elevated; below the dorso-lateral tumidity the side is concave, and inferior to the depression is an elongate swelling, traversed by a low longitudinal ridge, not very well defined; the rear of the

depression is bounded by the kidney-shaped branchial swellings which, viewed from above, are elevated above the median portion of the dorsum, which is convex, with a pair of pits near the swollen posterior edge. Antero-lateral margin rather deeply concave; antennal angle acute and margin posterior to it finely serrate. Pseudorostrum narrowly truncate in front, and very oblique as seen from the

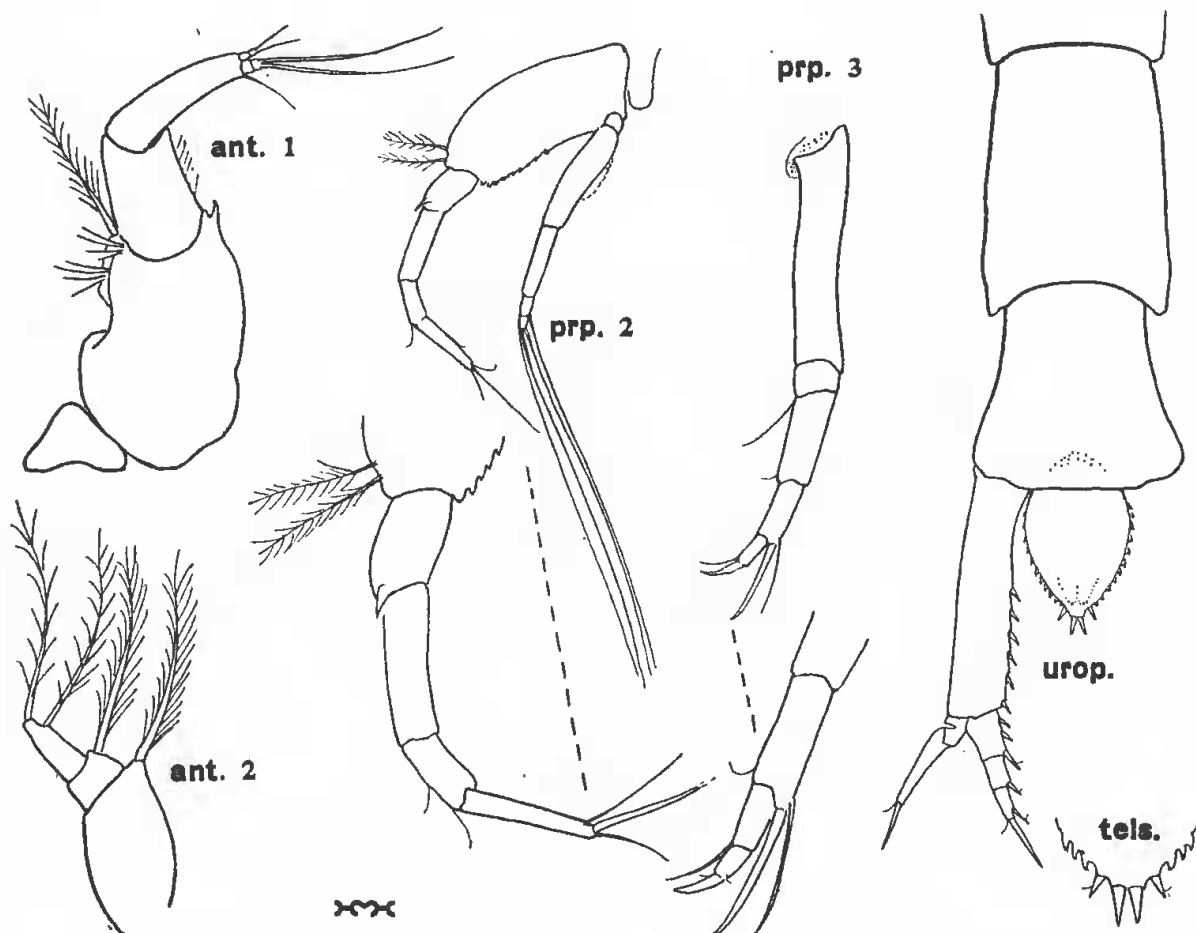


Fig. 36. *Gynodiastylis strumosa*, type female; ant., first antenna with upper lip, and second antenna ($\times 110$); prp., second and third peracopods ($\times 58$; distal joints, $\times 110$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 58$); tels., distal end of telson ($\times 110$).

side; lobes meeting for a distance equal to one-fifth of length of carapace. Frontal lobe well defined; ocular lobe rounded, twice as wide as long and with indistinct corneal areas.

First to third pedigerous somites successively increasing a little in length dorsally; pleural parts of second produced forwards across first somite, those of third moderately expanded anteriorly, and markedly so to the rear; fourth somite abruptly longer on the back, completely ankylosed with third, and with a dorso-lateral very swollen carina on each side.

Pleon cylindrical, not depressed; longer than cephalothorax; fifth somite one-third as long again as sixth, which is slightly dilated posteriorly, where it is as broad as long; telson cordate, plump, with lateral edges finely serrate; there is a very short post-anal part, armed with a pair of short stout terminal spines, flanked on each side by a similar spine.

First antenna relatively large and robust; first joint of peduncle with width equal to two-thirds its length, which is equal to that of the other two; second

joint little shorter than third; flagella each two-jointed and subequal in length, the main lash unusually short.

Second antenna as long as first joint of antennule; three-jointed, the terminal segment more than twice as long as second and apparently composed of two fused joints, a small terminal part being separated by a constriction but no suture.

Distal joints of third maxilliped and first pereopod missing.

Second pereopod shorter than third; basis almost as long as rest of limb; ischium completely suppressed; merus with a tooth at distal end; carpus half as long again as merus, nearly twice as long as propodus and barely longer than dactylus.

Third and fourth pereopods with basis as long, and nearly as long, as rest of limb; merus as long as carpus and propodus together; two distal carpal setae, subequal in length but one much stouter than the other, reaching just beyond tip of the stout dactylus. Fifth pereopod not much shorter than fourth.

Uropod with peduncle twice as long as telson and more than twice as long as the subequal rami; its inner margin bears half a dozen short robust spines in distal half; endopod three-jointed, the joints with three, one and one inner spines respectively; first segment longer than either second or third, which are subequal in length; terminal spine in both exopod and endopod half as long as the ramus.

Colour white. Length 4.1 mm.

Loc. Tasmania: off Babel Island, 39° 55' S., 148° 31' E., 0-50 metres ("Warreen" Station 29, Jan., 1939). Type in South Australian Museum, Reg. No. C. 2726.

The species offers some unusual features for the genus, notably the robust antennae. It agrees with *margarita* in having the peduncle of the uropod twice as long as the telson and at the same time twice the length of the endopod, but is in some other respects very different.

GYNODIASTYLIS MARGARITA sp. nov.

Ovigerous female. Integument not polished, but of pearly lustre, with fine but distinct reticulate pattern; indurated but rather fragile.

Carapace two-sevenths of total length of animal; three-fourths as deep as greatest breadth, which occurs across the branchial regions, and three-fourths as long again as deep; no well-defined sculpture, but there is a slight dorso-lateral tumidity on each side anteriorly, and a low boss at each postero-lateral corner of frontal lobe, while the branchial regions are somewhat inflated, rounded, with a slight hollow between them on the back, at the hinder end of which is a pair of pits. Antero-lateral margin almost straight, slightly notched above the finely dentate, obtuse, antero-lateral angle; inferior margin behind this with small serrations. Pseudorostrum subacute both as seen from above and from the side, the lobes meeting for a distance equal to more than one-fifth of total length of carapace; respiratory siphons rather long. Frontal lobe wide, distinctly marked off; ocular lobe very short and broad, with eyes visible as three opaque pale areas.

Pedigerous somites together well over half as long as carapace, successively increasing in dorsal length to fourth; pleural parts of second overlapping those of first in front; third somite only moderately expanded fore and aft on the sides, but second and third legs separated by a space decidedly greater than that between the other legs.

Pleon distinctly longer than cephalothorax and, like pedigerous somites, with pellucid spots; somites successively increasing a little in length, the fifth almost half as long again as sixth, which is not cylindrical like the others but is widened

posteriorly, where it is fully as broad as long; telson three-fourths as long as sixth somite, cordate, tapering in distal third to the narrowly rounded apex, which bears a pair of short spines, flanked on each side by a bristle; quite one-fourth of the dorsal plate is post-anal.

First antenna long, with basal joint of peduncle distinctly shorter than second and third combined; third about one-third as long again as second; both flagella two-jointed, the main lash only one-fourth as long as the last peduncular segment, the accessory not as long as the first joint of the other. Second antenna as long as first joint of peduncle of first antenna; it is four-jointed, the last segment tiny,

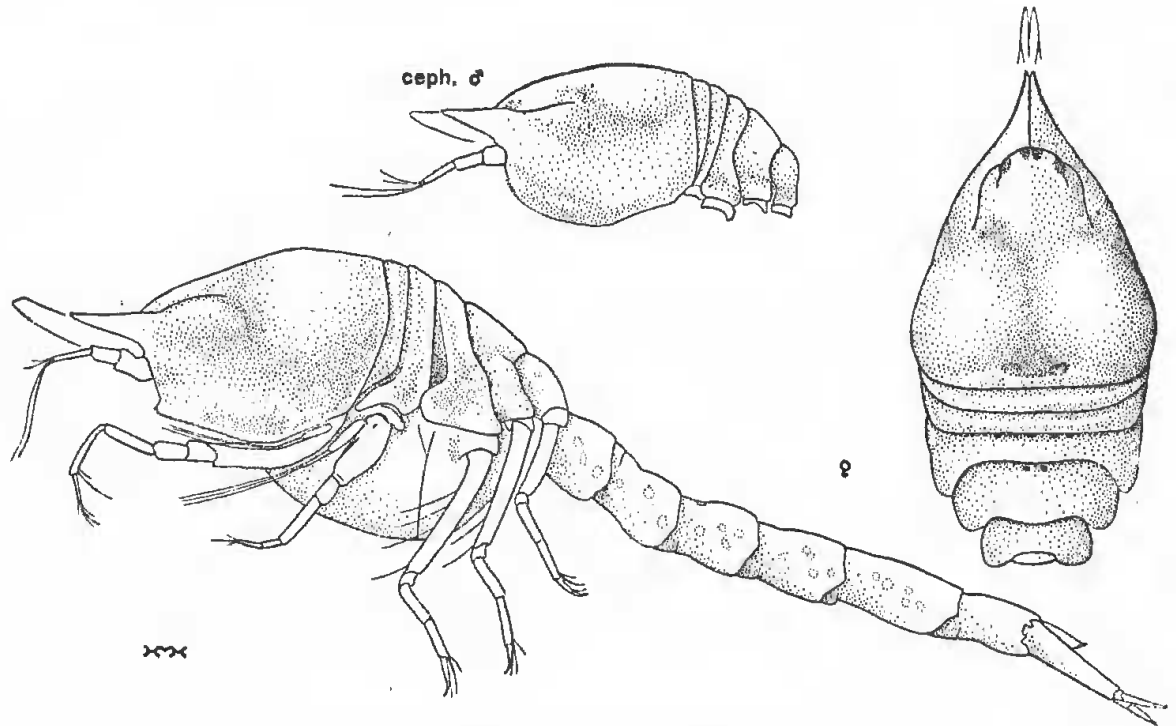


Fig. 37. *Gynodiastylis margarita*, type female; lateral view and cephalothorax from above. ceph., Cephalothorax of allotype subadult male from the side (all $\times 21$).

the third much longer than second and the first (which has a distal tooth) as long as second and third together (in the figures the two antennae are not shown to the same scale).

Mandible with nine or ten spines in the row.

Third maxilliped short and stout; basis a little shorter than rest of limb, distally dilated and a little forwardly produced externally, where the usual setae are stout and long; ischium, merus, and carpus wide; carpus, propodus, and dactylus subequal in length, each longer than either ischium or merus.

First peraeopod, when extended, reaching little beyond apex of pseudo-rostrum, its merus not quite attaining to level of antennal angle; basis about two-thirds as long as rest of limb, serrate on inner edge; propodus subequal in length to carpus, with a long and a short inner seta at distal end; dactylus barely more than half as long as propodus, with one of the terminal setae stout and as long as the joint; exopod slender.

Second peraeopod about two-thirds as long as first; basis stout, shorter than the slender exopod and less than two-thirds as long as remainder of limb; ischium suppressed; merus with a small distal tooth; carpus fully two and one-half times

as long as propodus, which is a little shorter than merus and is two-thirds as long as dactylus.

Fossorial peraeopods slender, the basis of fifth pair much shorter than that of the third and fourth pairs, in which it is fully as long as the remaining joints together; merus and carpus subequal in length, propodus only about half as long as either; one of the two carpal setae is stout, longer than the other and, like the slender propodal seta, reaches the level of tip of the short and slender dactylus.

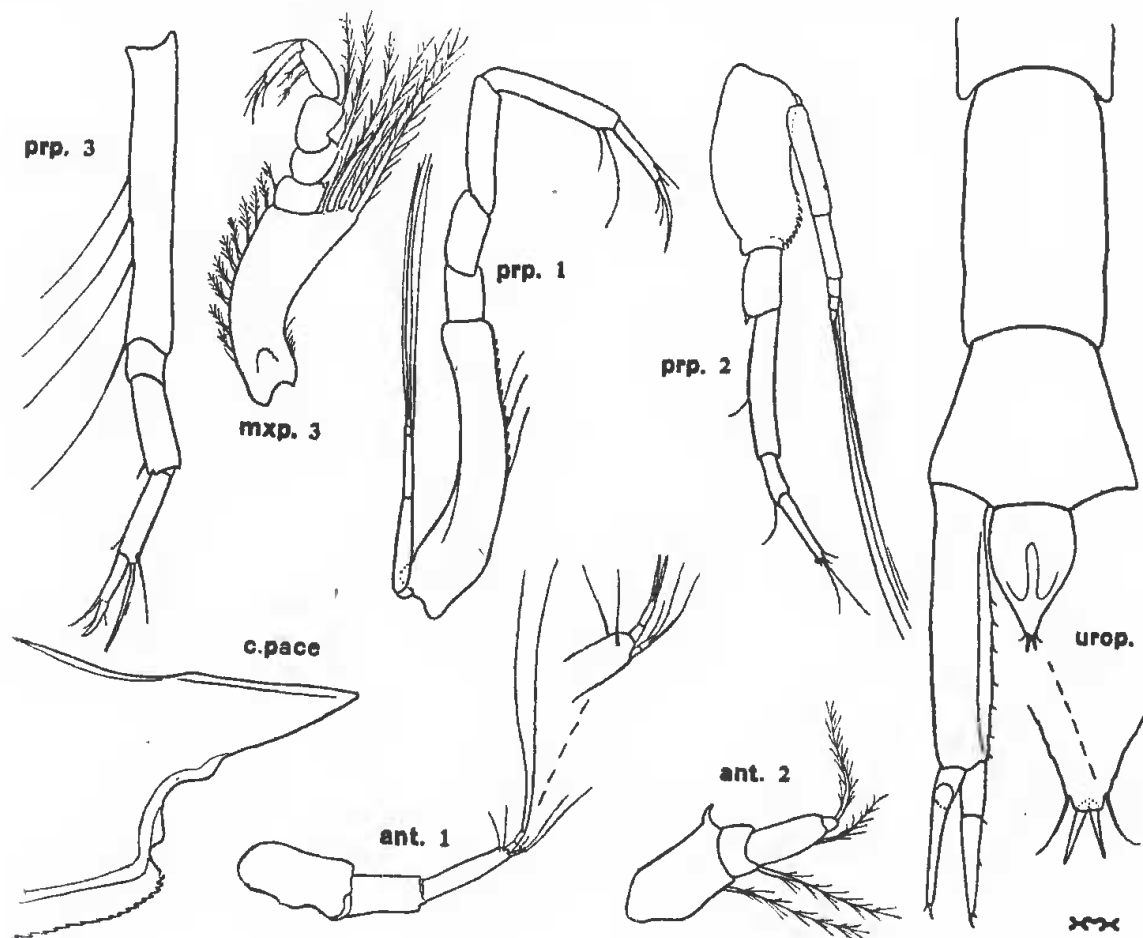


Fig. 38. *Gynodiastylis margarita*, paratype ovigerous female; c. pace, anterior portion of carapace ($\times 50$); ant. 1, first antenna ($\times 50$; flagella, $\times 115$); ant. 2, second antenna ($\times 115$); mxp. and prp., third maxilliped and first to third peraeopods ($\times 50$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 50$; distal end of telson, $\times 150$).

In combination with the other characters the uropods are distinctive; the peduncle is wide, not dilated distally, is almost as long as the sixth somite and telson together, and is twice as long as the subequal rami, both of which have insignificant terminal spines; armament is nowhere pronounced, there being seven or eight spaced spinules on inner margin of peduncle and three on that of endopod, which is two-jointed, the distal segment two-thirds as long again as the proximal one.

Length 5.3 mm.

Juvenile male. Lower edge of carapace bent down instead of outwards as in the female and antero-lateral angle more widely rounded; ocular lobe a little wider, but still exceedingly short. The uropods and other appendages are substantially as in the female; exopods are present on the first four pairs of peraeo-

pods. The uropod has the peduncle not quite as long as telson and sixth pleon somite together (probably longer than these in adult male) but fully twice as long as the rami; the proximal segment of the endopod does not differ in length from the distal so markedly.

Length 2.65 mm.

Loc. New South Wales: off Cape Three Points, 41-50 fath., bottom sticky mud and shell ("Thetis" Station 13, Feb., 1898); 5 miles off Eden, 60 metres, on mud (K. Sheard, submarine light, Dec., 1943); 4 miles off Port Hacking, 80 metres, on mud (type loc., K. Sheard, A. Trawl Station 13, May, 1944). Types in South Australian Museum, Reg. No. C. 2689-2690.

The species attains a length of over 6 mm.

GYNODIASTYLIS QUADRICRISTATA sp. nov.

Subadult female. Integument calcified, but thin and fragile.

Carapace large, two-fifths of total length of animal; it is subovate as seen from above, robust, less than half as long again as deep, and almost as wide as deep; on the back a pair of longitudinal carinae, arising at base of ocular lobe, are flanked on each side by a short dorso-lateral ridge, which commences near the hinder corner of frontal lobe; these four carinae reach to about middle of length of carapace, where they are connected by short transverse carinae; from

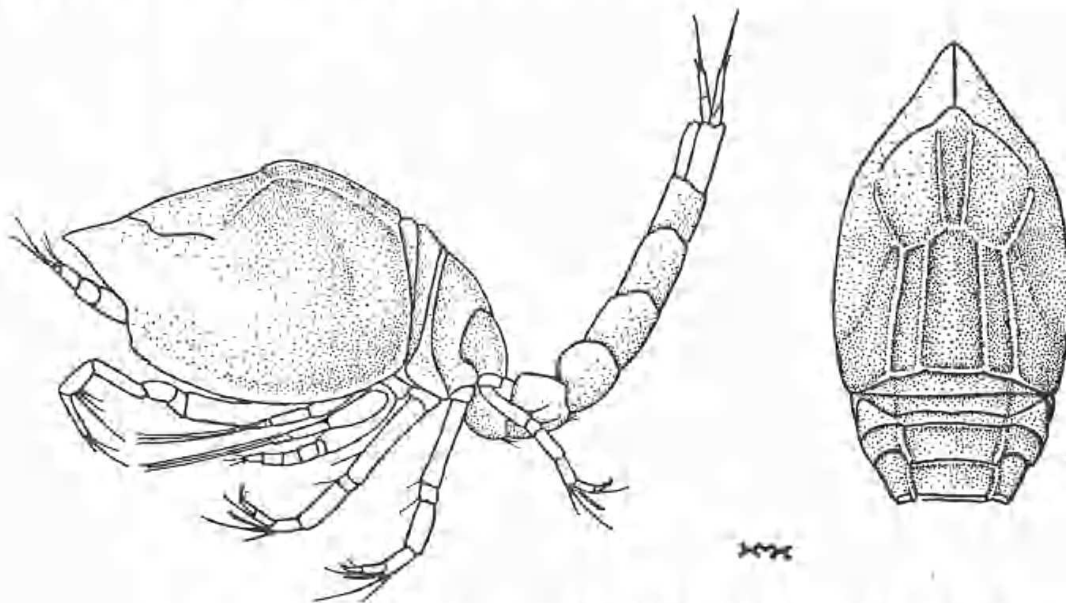


Fig. 39. *Gynodiastylis quadricristata*, type female; lateral view and cephalothorax from above ($\times 64$).

the last-named four longitudinal ridges extend to the crassate hinder margin; sides with a shallow depression, the upper edge of which is defined by a fairly well-marked curved ridge, the lower by a feeble fold. Antero-lateral margin very shallowly and rather angularly concave; antero-lateral angle and margin immediately posterior to it with a few teeth. Pseudorostrum pointed in front, triangular when viewed from above or from the side; lobes meeting for a distance equal to one-fifth of length of carapace. Frontal lobe very wide; ocular lobe wider than long, without apparent lenses.

Pedigerous somites crowded, the first concealed on sides; third very short dorsally but pleural parts expanded fore and aft; fourth and fifth of equal length

dorsally, each as long as first three together, and with a pair of dorso-lateral carinae; indications of similar ridges are present on the other somites.

Pleon distinctly shorter than cephalothorax, the somites not differing much in length; sixth about half as wide again as long and two-thirds as long as fifth, telson obovate, subequal in length to sixth somite, without post-anal portion and with no discernible apical spines.

First antenna robust, the first joint of peduncle as long as second and third together, the second wider but not longer than third; flagellum short, two-jointed, and accessory flagellum minute.

Third maxilliped with basis equal in length to remaining joints combined and with a spine at inner distal angle; the other joints do not differ much in length.

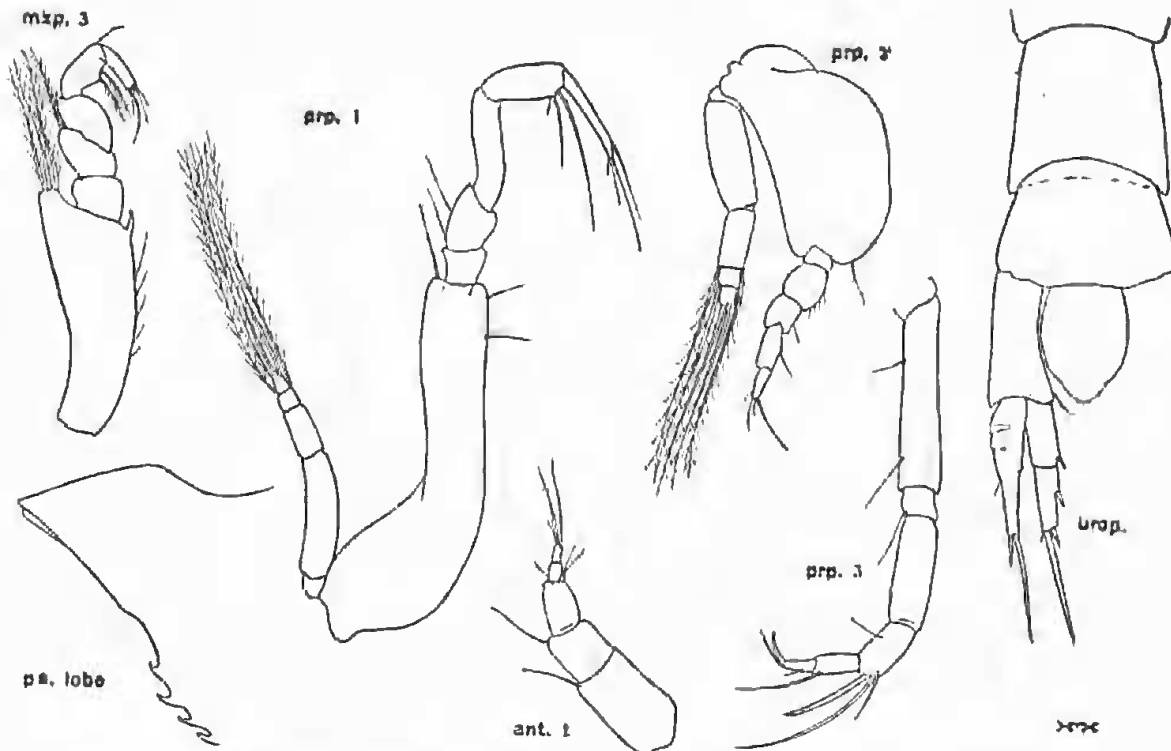


Fig. 40. *Gynodiastylis quadricristata*, type female; ps. lobe, pseudorostral lobe; ant., mxp. and prp., first antenna, third maxilliped and first to third peraeopods; urop., uropod with fifth and sixth pleon somites, and telson (all $\times 125$).

First peraeopod short, the carpus reaching beyond antennal angle but not attaining level of apex of pseudorostrum; basis fully as long as rest of limb; propodus barely two-thirds as long as carpus, not as long as ischium and merus combined, and with three unequal inner distal setae, the longest about twice as long as the joint; dactylus longer than propodus.

Second peraeopod rather less than half as long as first, with the wide basis nearly half as long again as rest of limb; ischium distinct; merus subequal in length to propodus and longer than carpus or dactylus, which are of about the same length.

Third and fourth peraeopods with merus more than half length of basis and not much longer than carpus and propodus together; propodal seta slender, reaching beyond tip of distinctly separated dactylar claw; last of distal carpal setae stout not reaching to end of dactylus but preceding seta slender and attaining same level as that of propodus; fifth peraeopod two-thirds as long as fourth.

Uropod short and robust; peduncle barely longer than telson, little more

than twice as long as broad and as long as the subequal rami; endopod composed of two equal joints with one and two inner spines respectively; terminal spine, like the longer of the exopodal spines, four-fifths as long as the ramus.

Colour milk white. Length 1.36 mm.

Loc. Queensland: Noosa River, below Gympie Terrace, surface (I. S. R. Munro, Station T/44.1, 50 cm, 40 m. net, 9.12 p.m., Mar. 25, 1944). Type in South Australian Museum, Reg. No. C. 2682.

GYNODIASTYLIS BREVIPES sp. nov.

Female with developing marsupium. Integument calcified but thin; smooth and polished.

Carapace robust, boldly arched above; it is barely one-third of total length of animal, half as long again as pedigerous somites together; one-third as long again as deep and a little compressed; on each pseudorostral lobe a short longitudinal dorsal ridge runs from apex to ocular lobe and a second curved carina extends from the tip to just below posterior end of frontal lobe; on each side

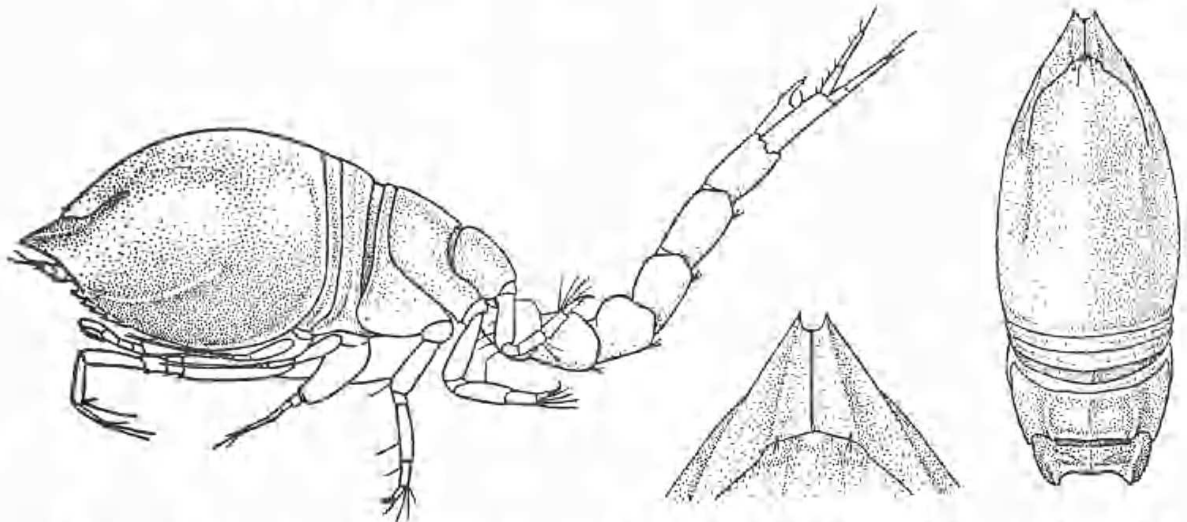


Fig. 41. *Gynodiastylis brevipes*, type female; lateral view and cephalothorax from above ($\times 21$); pseudorostrum and ocular lobe ($\times 90$).

of carapace are two further faint ridges forming the upper and lower boundaries of a somewhat flattened semi-oval area, not, however, well defined; there is a very shallow depression on each side of frontal lobe and a pair of short ridges on ocular lobe, which is armed with a pair of spinules. Antero-lateral margin sinuate, scarcely concave; a few strong teeth (serrations) behind antennal angle, the first constituting the angle itself. Pseudorostral lobes narrowed in front, acute as seen from the side, excavate from above, meeting for a distance equal to about one-ninth length of carapace. Frontal lobe well-marked; ocular lobe very short and broad, with three ill-defined oval areas representing the eyes.

Pleural parts in second pedigerous somite forwardly expanded, in third expanded in front and (more markedly) posteriorly, and in fourth backwardly produced; second and third peraeopods not separated by a very pronounced interval; first to third somites each with a transverse fold; fourth (which is the longest dorsally) and fifth (which is not much shorter) each with a pair of strong longitudinal dorsal carinae, and with anterior and posterior margins between these ridges crassate.

Pleon a little shorter than cephalothorax, with somites one to six quite smooth; fifth not much longer than sixth, which is about as wide as long; telson equal in length to sixth somite, with distinct post-anal portion, armed with a pair of rather slender apical spines; an insignificant tooth on each side of terminal spines and a much larger tooth at base of post-anal part.

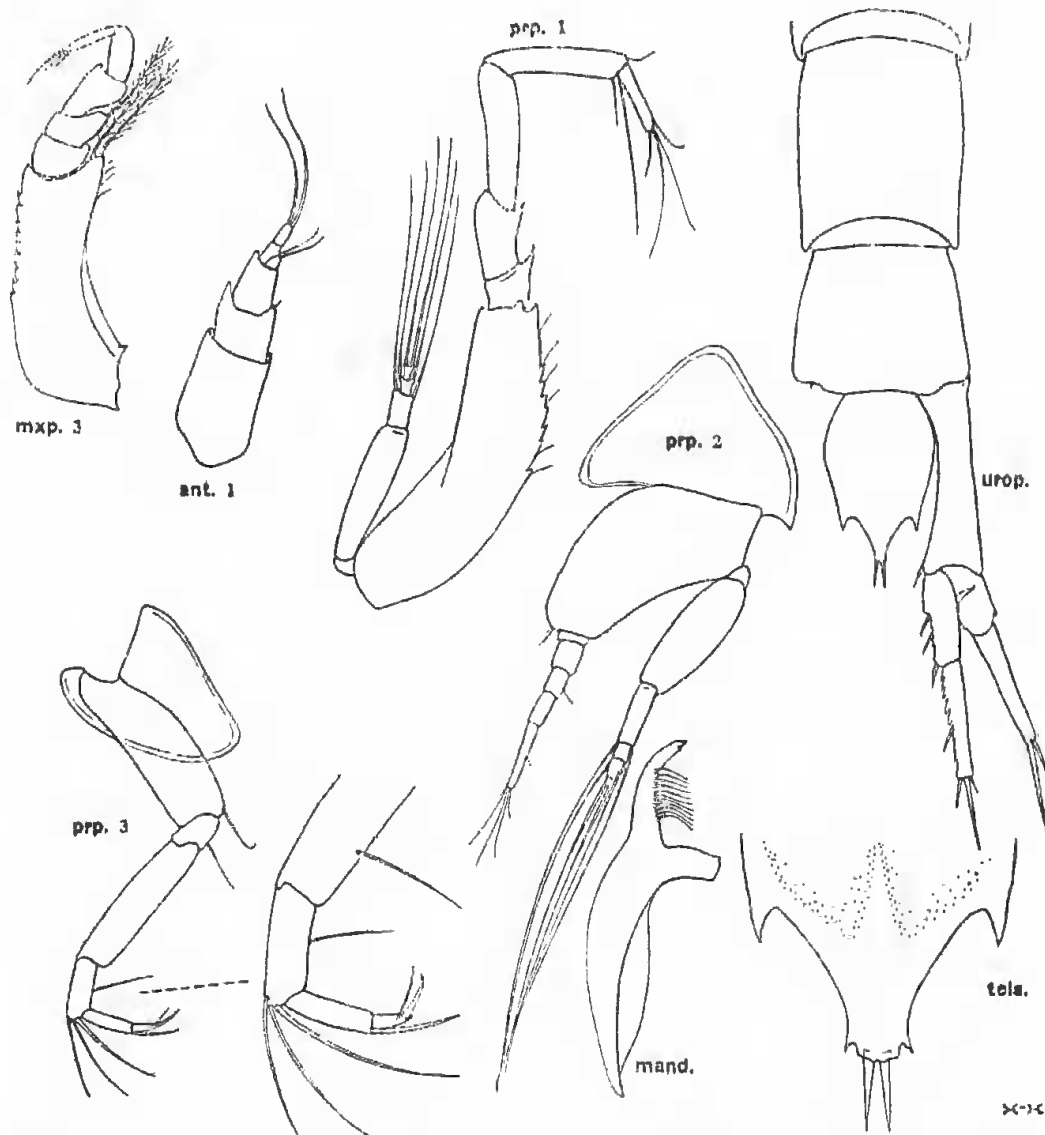


Fig. 42. *Gynodiastylis brevipes*, type female; ant., first antenna ($\times 125$); mand., mxp. and prp., mandible, third maxilliped and first to third peraeopods ($\times 76$; distal joints of third leg, $\times 125$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 76$); tels., distal portion of telson ($\times 250$).

First antenna stout and short; first joint of peduncle longer than second and third together; second subequal in length to third; flagellum two-jointed, and accessory lash very small.

Mandible of usual form with about eleven spines in the row; it is elongate and is as long as third maxilliped without dactylus.

Basis of third maxilliped only about one-seventh as long again as rest of limb; carpus, propodus and dactylus subequal in length, each longer than ischium or merus.

First peraeopod stout, not reaching much beyond apex of pseudorostrum when extended; basis serrate on inner margin, distinctly shorter than remaining joints together; ischium and merus (like basis) with a tooth at inner distal angle; carpus and propodus subequal in length, each twice as long as dactylus; only two or three propodal setae.

Second peraeopod shorter than third or fourth, with exopod (not including setae) as long as the basis, which is one-third as long again as the rest of limb; ischium distinct; merus, carpus and propodus not differing much in length, each about half as long as dactylus.

Second to fifth peraeopods moderately robust; merus shorter than basis, and much less than twice as long as carpus and propodus combined; carpus with three distal setae, all slender, the longest, like propodal seta, reaching to level of tip of slender dactylus.

Peduncle of uropod barely longer than telson, with an inner spine at distal end; endopod with inner margin serrate, a little longer than exopod which is equal in length to peduncle; two-jointed, the first joint with three inner spines and three-fourths as long as second, which bears two inner spines, the second distal; the long terminal spine is less than half the length of the ramus; exopod with longer of the unequal terminal spines more than half as long as the ramus.

Colour white. Length 3.1 mm.

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt, type loc., K. Sheard, Oct., 1943); 4 miles off Port Hacking, 80 metres, on mud (K. Sheard, A. Trawl, May, 1944); Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2656.

Two ovigerous females from the type locality are smaller than the type (2.7 mm.) and than adult females from Brush Island, but differ only in having the appendages slightly more slender, although the joints are of the same proportions.

GYNODIASTYLIS CONCAVA sp. nov.

Ovigerous female. Integument dull, with small but distinct reticulate patterning.

Carapace less than one-third of total length of animal, as wide as deep, one-third as long again as broad, and with each side deeply concave; the lateral hollow is somewhat quadrilateral and is margined below by a longitudinal ridge, its rear edge forms a transverse carina and its upper limit is defined by a dorso-lateral fold, which extends back quite to posterior margin of carapace; dorsum depressed between hinder third of dorso-lateral ridges, slightly rounded (almost flat) over frontal lobe; seen from above the carapace is subtriangular in shape, tapering to the front and broadest across branchial regions; viewed thus the outbent inferior edge is visible at the rear. Antero-lateral margin deeply concave, antennal angle subacute and inferior edge posterior to it finely serrate. Pseudorostrum subacute in front when viewed either from above or from the side, the lobes meeting for a distance equal to fully one-fifth of total length of carapace. Frontal lobe large, distinctly separated off; ocular lobe rather small, twice as wide as long, rounded and with three small, pale eyes.

Pleural parts of all pedigerous somites exposed, but those of first partly overlapped by anterior pleural lobe of second; third somite, like second, short dorsally, but moderately expanded fore and aft on sides, where it overlaps second in front; second and third peraeopods not very widely separated; there is a dorso-lateral carina on each side of fourth somite.

Pleon as long as cephalothorax, the anterior somites, like pedigerous, with obsolete granulation; subcylindrical excepting for sixth somite which is broadened posteriorly; fifth somite about half as long again as sixth, which is as wide as long; telson almost as long as sixth somite, tapering, without any abrupt constriction, only in distal third of length; postero-lateral margins serrate; there is a very short post-anal portion, with two terminal spines, rather stout, and flanked on each side by a smaller spine, anterior to which are one or two pairs of bristles.

First antenna with the first joint of peduncle about as long as second and third together, and third little longer than second (third much longer than second in *tumida*); flagellum two-jointed, only half as long as third peduncular segment, and accessory flagellum minute. Upper lip unusually elongate.

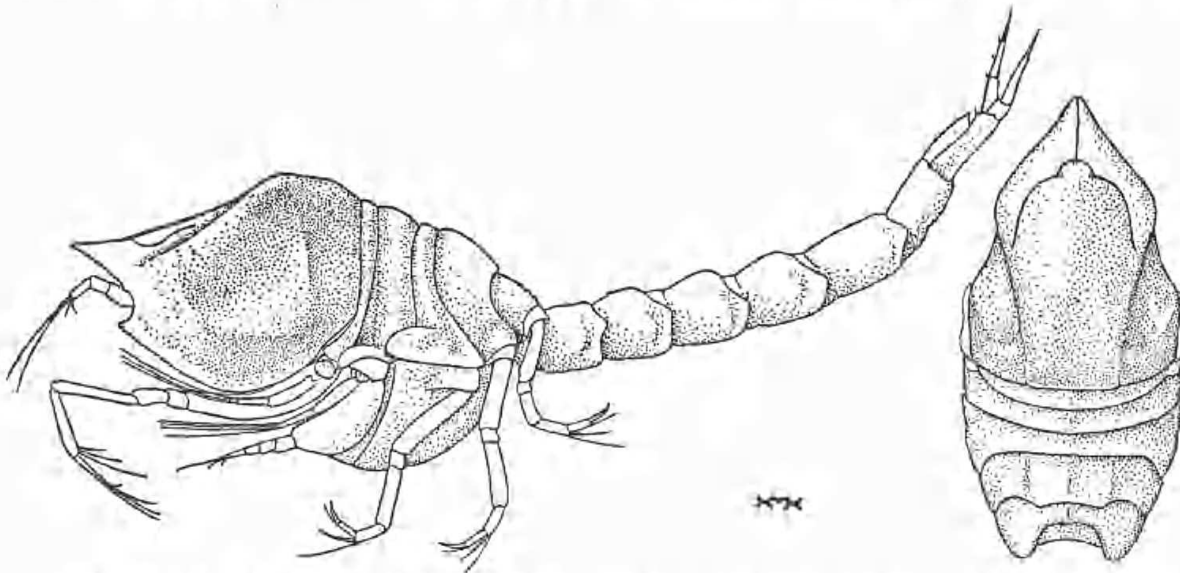


Fig. 43. *Gynodiastylis concava*, type female; lateral view and cephalothorax from above ($\times 35$).

First peraeopod slender and rather long, the carpus reaching to level of apex of pseudorostrum; basis less than two-thirds as long as remaining joints together, and with a small tooth at inner distal angle and some serrations on sides; propodus elongate, not dilated, fully one-third as long again as dactylus, and not much shorter than propodus, which is almost half as long again as the combined lengths of ischium and merus; propodus with three unequal setae at distal end of inner margin, one of them longer than propodus; dactylus with several long terminal setae.

Basis of second peraeopod half as long again as rest of limb (which is abbreviated) and with two teeth at outer distal angle; ischium suppressed, merus serrate on inner edge, subequal in length to either carpus or propodus; the last-named is two-thirds as long as the dactylus, which has very slender setae, one of the terminal ones being longer than the joint.

Third and fourth peraeopods with basis shorter than rest of limb, and with merus about one-third as long again as carpus and propodus together; one of the two distal carpal setae is shorter and much stouter than the others and (unlike the latter and the propodal seta) does not reach to level of tip of dactylus; fifth peraeopod a little shorter than the others.

Peduncle of uropod stout, a little longer than the telson and than the rami, with a short inner spine at distal end and anterior to it a short seta; endopod

slightly longer than exopod, with a distinct suture marking off a proximal joint which is half as long as the rest of the ramus and a faint groove (but no actual suture) dividing the remainder into two portions equal in length; inner margin with only three spines, one at distal end of first joint, one at the aforementioned groove and one alongside the terminal spine, which is a little longer than that of exopod and as long as the proximal joint of its ramus.

Colour cream. Length 2.6 mm.

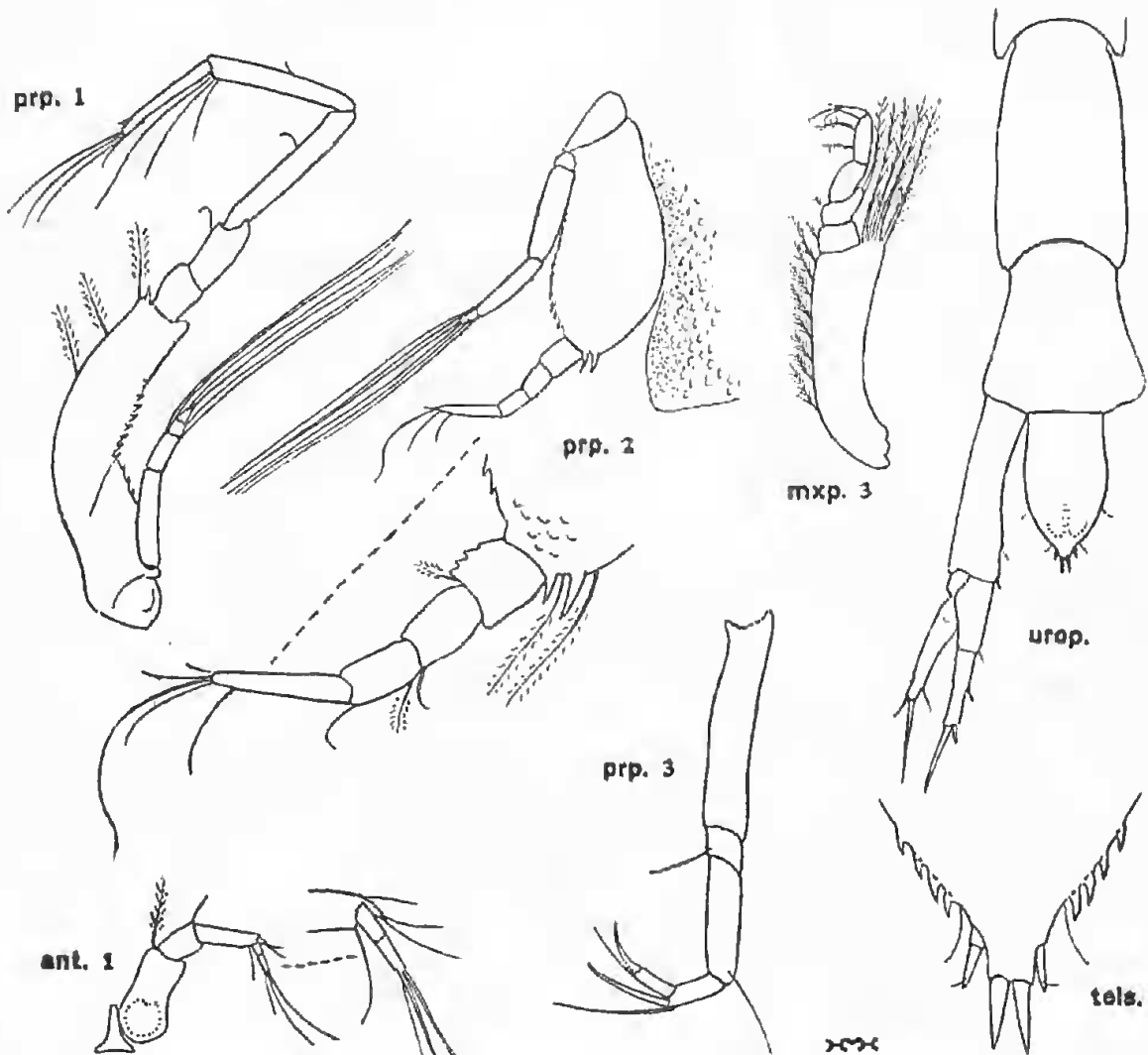


Fig. 44. *Gynodiastylis concava*. Type female; prp., first to third pereopods ($\times 70$; distal joints of second leg, $\times 150$). Paratype ovigerous female; ant., first antenna and upper lip ($\times 70$; flagella, $\times 150$); mxp., third maxilliped ($\times 70$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 70$); tels., distal end of telson ($\times 300$).

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt (type loc., K. Sheard, Oct., 1943). Tasmania: off Babel Island, $39^{\circ} 55' S.$, $148^{\circ} 31' E.$, 0-50 metres ("Warreen" Station 29, Jan., 1939).

A single female comes from Tasmania; it has the marsupium not fully developed, but is 3.3 mm. in length, thus being larger than ovigerous females from New South Wales.

This species resembles *tumida* in some respects, but is separated by the different proportions of the appendages, the absence of lateral prominences on the dorso-lateral folds of the carapace of the adult, the different telson, etc.

GYNODIASTYLIS TUMIDA (Hale).

Paradiastylis tumida Hale, 1937, p. 66, fig. 3-4.

This species now falls into place with others of the genus in which the telson has a tapering post-anal portion and lateral serrations. The mature male, previously unknown, has no pleopods.

Examples from St. Vincent Gulf, South Australia, and Sydney Harbour, New South Wales, as previously described, resemble each other closely. Some

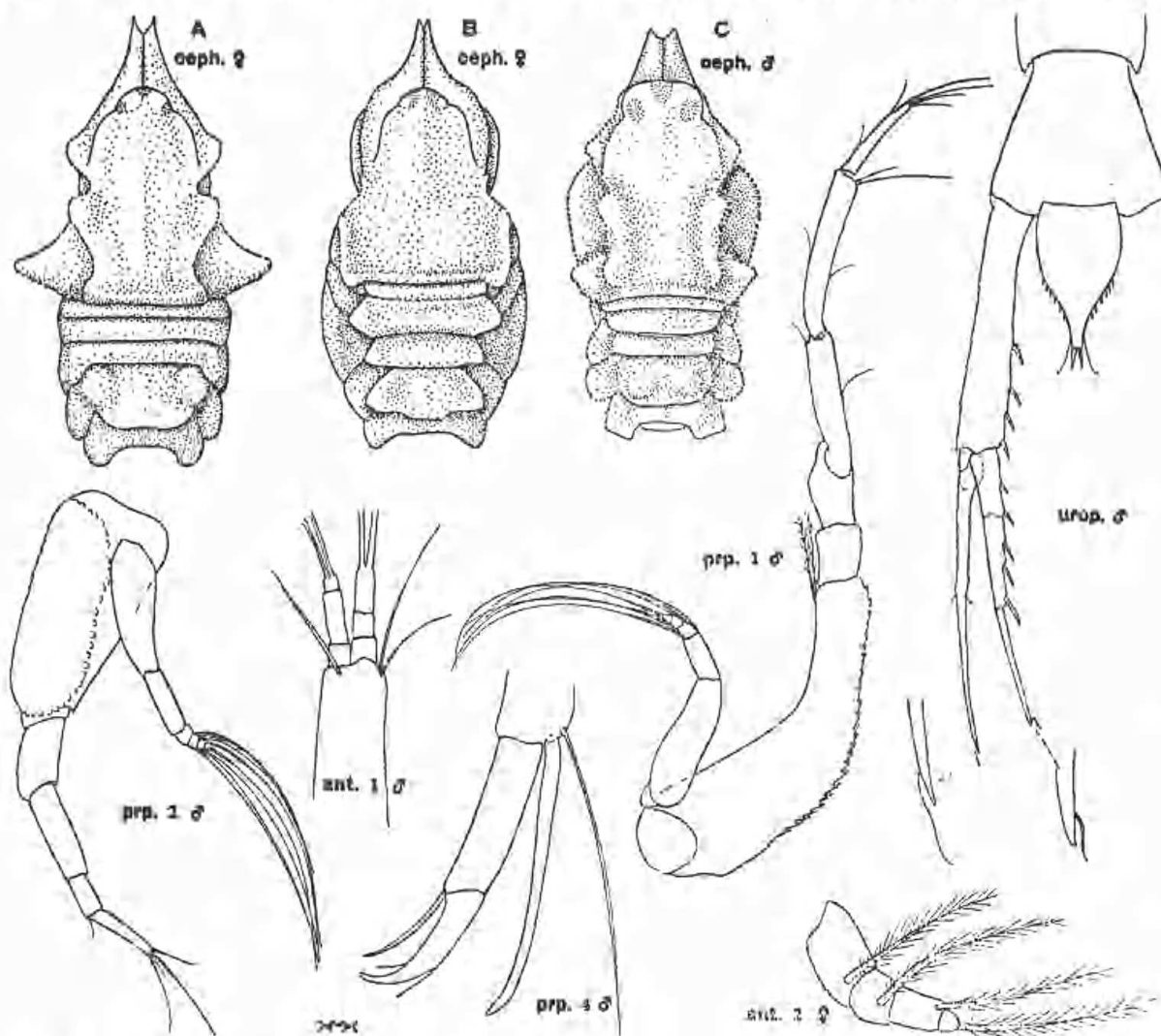


Fig. 45. *Gynodiastylis tumida*. Subadult female from Tasmania; A, ceph., cephalothorax from above ($\times 25$); ant. 2, second antenna ($\times 120$). B, ceph., Cephalothorax of ovigerous female from Spencer Gulf, South Australia ($\times 25$). Adult male from Spencer Gulf; C, ceph., cephalothorax from above ($\times 25$); ant. 1, flagella of first antenna ($\times 250$); prp. 1-2, first and second peraeopods ($\times 65$); prp. 4, distal joints of fourth peraeopod ($\times 250$); urop., uropod with sixth pleon somite and telson ($\times 65$).

specimens from Tasmania (Kettering, 2-3 fath., W. S. Fairbridge, submarine light, Jan., 1945). and others from Spencer Gulf, South Australia (Western Shoal and Port Lincoln, K. Sheard, submarine light, tow-net, Feb., 1938, and Feb., 1944) exhibit quite considerable differences in the shape of the carapace, but as the fundamental arrangement of the folds and projections is the same in all, and as all have the uropods and other appendages very similar they are provisionally regarded as variants of the one species although it may well be

that more complete series of the adults of both sexes will lead to the recognition of three separate species.

Even quite juvenile females of all have the lateral prominences of the dorso-lateral folds of the carapace; normally in the second leg the ischium (not made out in the type) is distinct, though it is short and collar-like; the wide basis is always distinctly shorter than the rest of limb and the propodus is shorter than the dactylus. The second antenna of the female is four-jointed the first segment as long as second and third together, the fourth small.

Tasmania. A young male and female, and a female with developing marsupium have the carapace as shown in fig. 45, A; the dorso-lateral folds are much as previously illustrated for the ovigerous female, although the most anterior of their lateral projections are less swollen; the rounded elevation near hinder margin on each side, however, is here strikingly different, being greatly enlarged, while the fourth pedigerous somite has the pair of dorso-lateral ridges swollen and elevated. The carapace and lateral parts of pedigerous somites bear distinct granules. Apart from the character of the carapace the juvenile male differs from the young male previously recorded, and from the adult male described below, in having the endopod of the uropod distinctly three-jointed instead of two.

Spencer Gulf, South Australia. An ovigerous female has the integument indurated but translucent, quite unlike that of the white or pearly exoskeleton of the type examples and the Tasmanian specimens; it has the anterior part of the dorso-lateral fold of carapace somewhat swollen as in the type, but the posterior portion is cristate, projecting laterally and overhanging the not very conspicuous tumidity on the side (fig. 45, B); the curved ridge which runs forward from the last-named elevation is low and rounded in the examples previously recorded and in the Tasmanian material, but in this female it is almost cristate and is visible when the animal is viewed from above; the lateral concavity is more pronounced than in the types. The second to fourth pedigerous somites have the dorsum elevated transversely and produced on each side to form a dorso-lateral tumidity which is almost cristate on the fourth somite.

The only fully mature males in hand were taken in this Gulf.

Adult male. Integument finely granulate, calcified, but semi-transparent.

Carapace one-third of total length of animal and two-thirds as long again as pedigerous somites together; it is less than twice as long as deep, and is broader than deep because of the great prominence of the lower lateral ridge (see fig. 45, C); the three dorso-lateral projections are much developed, as is also the elevation lower down on side of carapace from which curves forward the lower carina. Antero-lateral margin excavate to form a distinct antennal notch; antennal angle obtuse, the margin below broadly rounded. Pseudorostrum slightly downbent (thus foreshortened in fig. 45, C.) obliquely truncate anteriorly; lobes meeting for a distance equal to more than one-fifth of length of carapace. Frontal lobe with sutures fused; ocular lobe large and tumid, twice as wide as long, with three prominent pale lenses.

The large fourth pedigerous somite has a pair of dorsal tumidities.

Pleon as long as cephalothorax; telson about as long as sixth somite, with post-anal portion rather more tapered than in female and with two apical spines, flanked by a pair of bristles inserted infero-laterally; lateral serrations small, but distinct.

As in the female the last peduncular joint of the first antenna is rather long; both flagella appear to be three-jointed (see fig. 45, ant. 1), and the accessory is not much shorter than the main lash.

The second antenna is so generously furnished with sensory hairs that the

whole appendage resembles a dense brush; the flagellum is very short, not as long as last peduncular joint, and consists of seven segments.

Mandible with nine or ten spines in the row.

First peraeopod with basis two-thirds as long as rest of limb; carpus (which attains level of antennal angle) shorter than propodus, which is nearly twice as long as dactylus; the propodal setae are not very long and number only two or three.

Second peraeopod with ischium distinct and with carpus distinctly longer than merus, and more than twice as long as propodus, which is almost two-thirds as long as dactylus.

Third to fifth peraeopods with one very stout and one bristle-like carpal seta as in female (fig. 45, prp. 4).

The first to fourth legs bear exopods.

Uropod relatively longer than in female; peduncle nearly twice as long as telson and with four inner spines in distal half; endopod nearly two-thirds as long as peduncle, two-jointed, the first segment three-fourths as long as second (my assumption that the two-jointed condition in the young male previously described was necessarily due to immaturity was too premature); there are two spines on inner edge of first joint, three on second, and a terminal spine three-fourths length of ramus; exopod with a stout and long terminal spine, which is as long as ramus but is not distinctly marked off from it; the ramus, not including spine in the length, is a little shorter than endopod.

Length 2.8 mm.

GENUS *DICOIDES* nov.

Like *Gynodiastylis* but (1) first peraeopod massive in both sexes, reaching for greater part of its length in front of carapace and with propodus as long as, or longer than, the basis; (2) exopods present on first four pairs of peraeopods of female.

Genotype *Dic brevidactylum* Hale.

In the genotype the thoracic exopods are all small; in the two other species referred to the genus those of the first and second peraeopods are larger than the others but are still rather poorly developed. The basis of the second leg, like that of the first, is relatively short. The telson is subcylindrical, with no distinct post-anal portion, its lateral margins are without serrations or lateral spines, and the terminal spines are rudimentary in both sexes. The third maxilliped is as in *Gynodiastylis*, with the ischium not dilated as it is in *Dic*.

KEY TO SPECIES OF *DICOIDES*

- | | |
|--|-----------------------------|
| 1. Dactylus of first peraeopod longer than propodus | <i>areolata</i> sp. nov. |
| Dactylus of first peraeopod less than half as long as propodus | 2. |
| 2. Rostral siphons very long, at least half length of carapace. Telson much longer than sixth pleon somite | <i>brevidactyla</i> (Hale). |
| Rostral siphons short. Telson much shorter than sixth pleon somite | <i>fletti</i> sp. nov. |

DICOIDES AREOLATA sp. nov.

Ovigerous female. Integument lightly calcified but opaque. Carapace small, only one-fourth of total length of animal and one-third as long again as pedigerous somites together; it is three-fourths as long again as deep, and barely wider than deep; on each side there is a shallow pit behind frontal lobe, and dorso-laterally

an elongate rounded ridge running from near front of pseudorostrum to beyond frontal lobe; this ridge is most distinct when the carapace is viewed from above; the sides are slightly concave, and posterior to the hollow are marked with faint striae. Antero-lateral margin shallowly concave; antero-lateral angle obtuse and margin posterior to it finely serrate (fig. 47, ps, lobe). Pseudorostrum subacute as seen from the side and from above, the lobes meeting in front of ocular lobe for a distance equal to almost one-sixth of length of carapace, gaping slightly at extreme apex. Frontal lobe distinctly defined, the sutures not fused; ocular lobe rounded, tumid, wider than long, with a pale area on each side apparently representing the eyes.

Third to fifth pedigerous somites projecting backwards on side, the third and fourth dorsally longer than the other somites; first to fourth each with a well-marked transverse furrow.

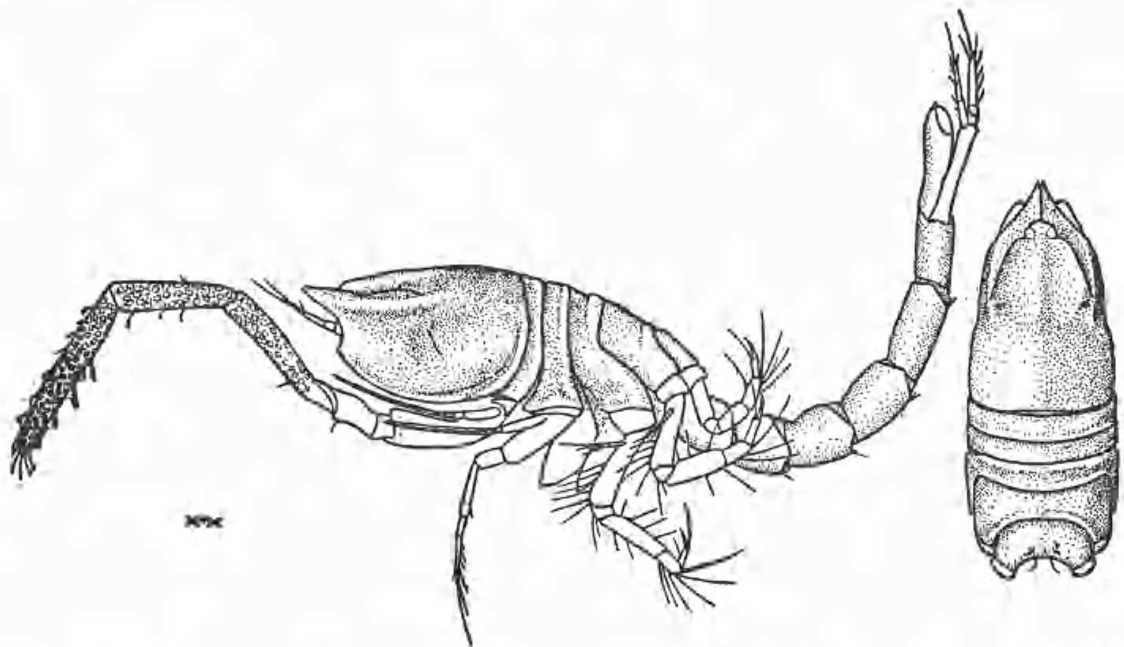


Fig. 46. *Dicoides areolata*, paratype female; lateral view and cephalothorax from above ($\times 28$).

Pleon distinctly longer than cephalothorax, with somites subcylindrical; fifth somite more than one-third as long again as sixth which is somewhat dilated at distal end, where it is almost as wide as long; telson longer than any of the other somites and three-fourths as long again as sixth.

First antenna with third peduncular joint relatively long, three-fourths length of first, but not much longer than second; flagellum two-jointed and accessory flagellum very small.

Mandible with about ten spines.

Third maxilliped with basis as long as rest of limb; serrate on inner margin; ischium with a small inner distal spine; propodus and carpus subequal in length, each longer than dactylus or merus.

First peraeopod with merus reaching beyond level of antennal angle, more than half of total length of the limb projecting beyond anterior end of carapace; basis only one-fourth of length of remaining joints together; carpus two and one-half times as long as merus and not very much longer than the propodus, which is widest at distal end; dactylus extraordinarily massive, the longest of the joints

of this limb, and as long as merus and carpus together; terminal dactylar setae short, one stouter than the others; carpus, propodus and dactylus patterned with transparent circular areas (fig. 47, prp. 1).

Second peraeopod long and slender; basis not much longer than merus and carpus together; ischium suppressed; merus elongate, as long as propodus and

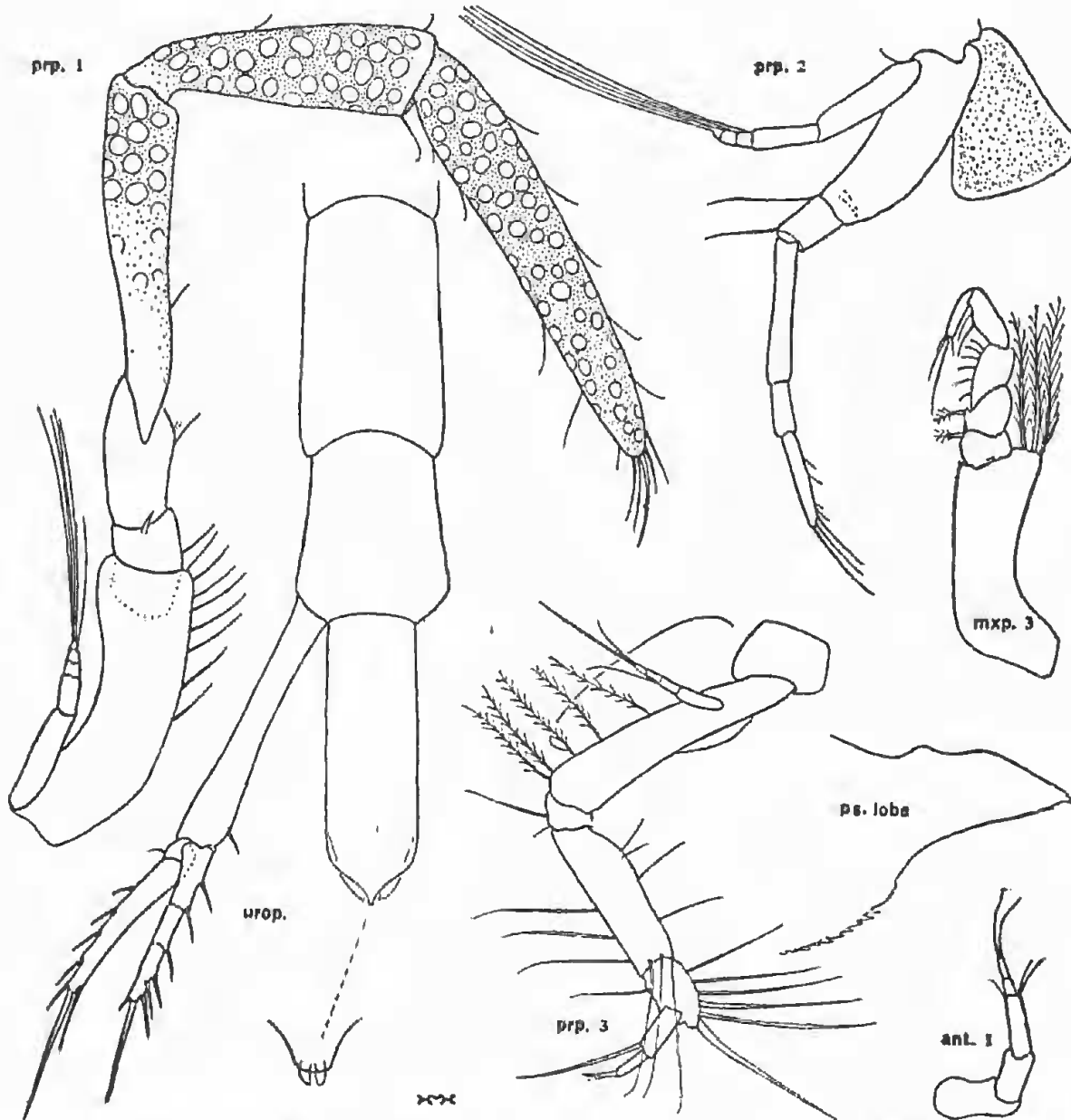


Fig. 47. *Dicoides areolata*, paratype female; ps. lobe and ant., pseudorostral lobe and first antenna; mxp. and prp., third maxilliped and first to third peraeopods; urop., uropod with fifth and sixth pleon somites, and telson ($\times 70$; distal end of telson, $\times 240$).

dactylus together; dactylus less than twice length of propodus and with longest distal setae as long as the joint.

Fourth peraeopod shorter than second, and fifth considerably shorter than fourth; in the third and fourth pairs the merus is almost as long as carpus, propodus and dactylus together; exopods of these limbs with peduncle and three-jointed flagellum furnished with three setae; the propodal seta and the distal carpal setae reach well beyond tip of dactylus.

Peduncle of uropod slender, not quite as long as telson, unarmed except for a single inner spine near distal end; exopod nearly three-fourths as long as peduncle, and longer than endopod, with five slender spines on outer margin, one (subdistal) on inner, and a terminal spine shorter than its second joint; endopod divided into three segments, with two, one and three inner spines respectively; distal and proximal joints subequal in length, each longer than second joint; terminal spine (which has a small outer spine near its base) as long as second and third joints together.

Colour cream. Length 3.0 mm.

Adult male. Differs little from the female excepting for the following:

First peraeopod shorter, the carpus reaching only to level of apex of pseudo-rostrum, and pleon more slender. The telson, as in the female, has only rudimentary terminal spines.

The second antenna has the flagellum a little longer than the peduncle and composed of eleven to twelve joints.

Basis of third maxilliped slightly longer than rest of limb; serrate on inner edge.

The first to fourth peraeopods have well-developed exopods.

Uropod with peduncle distinctly longer than telson; endopod almost as long as exopod, and two-jointed but with a third segment (comparable to that of female) marked off by a fused suture; there is one inner spine on peduncle as in female and the inner spines of endopod segments are three or four, two and two.

Length 2.6 mm.

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt (K. Sheard, Oct., 1943); Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (type loc., D. Rochford, Jan., 1945). Types in South Australian Museum, Reg. No. C. 2700-2701.

The remarkable structure of the first peraeopod is a characteristic feature; this and the long setae of the posterior peraeopods, together with the elongate telson, are distinctive.

A female from off Eden, 3.5 mm. in length and with developing marsupium was dissected and figured.

DICOIDES BREVIDACTYLA (Hale).

Dic. brevidactylum Hale, 1937, p. 69, fig. 6-7.

Ovigerous female, New South Wales form. It would seem that this bears the same relation to the types as do eastern coast examples of some of the other species which occur also in South Australia. One may cite for instance *Cyclaspis crestata* (Hale, 1944, p. 91) and *Bodotria maculosa* (Hale, 1944a, p. 226); it is possible that the differences may prove constant enough to warrant subspecific rank.

In this case the thorax and its appendages are as in the South Australian types, but the difference lies in a general elongation of the animal. The female is slightly smaller than the type (2.5 mm. as against 2.7 mm.) but the telson is relatively longer, reaching beyond the distal end of peduncle of uropod, while the first five pleon somites together are equal in length to the cephalothorax instead of shorter than it. The branchial siphons are remarkably long, about three-fourths the length of carapace. In the first peraeopods one of the terminal dactylar setae and one near distal end of propodus are stout and almost spine-like.

Small exopods are present on the first to fourth peraeopods; these are similarly developed in the type female. Although all have peduncle and flagellum they are, as previously noted, quite rudimentary, with short setae; those of the first pair

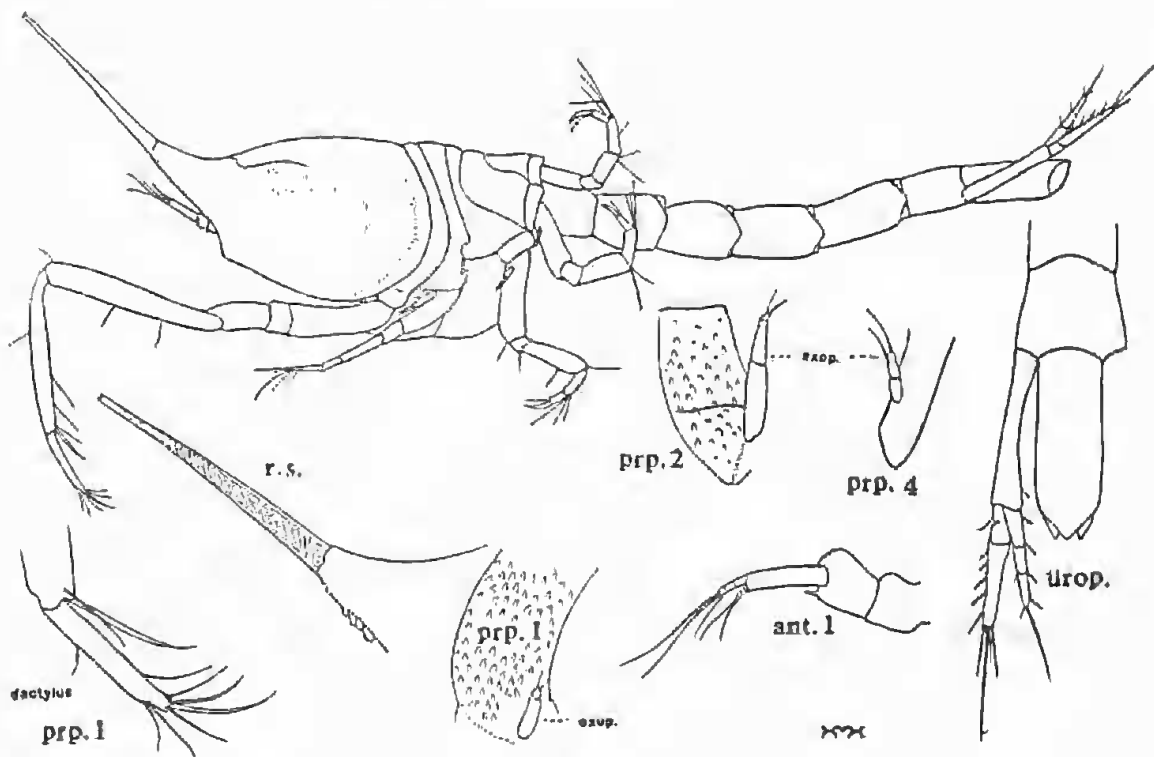


Fig. 48. *Dicoides brevidactyla*, ovigerous female of New South Wales form; lateral view of whole animal ($\times 39$); r.s., rostral siphon ($\times 60$); ant., first antenna ($\times 95$); dactylus prp. 1, dactylus of first pereopod; exop., exopods of first, second and fourth pereopods ($\times 95$); urop., uropod with sixth pleon somite and telson ($\times 58$).

are little, if any, larger than those of the third and fourth legs and are less than half the length of the exopod of the second leg.

Loc. New South Wales: 4 miles off Eden, in silt, 70 metres (K. Sheard, Oct., 1943).

Although no eye is apparent in examples preserved in alcohol, it is represented by a spot of vivid red pigment in South Australian specimens freshly preserved in formalin.

DICOIDES FLETTI sp. nov.

Ovigerous female. Integument calcified, with fine but distinct reticulate patterning, and with well-spaced granules on carapace.

Carapace relatively small, not much more than one-fourth of total length, and little longer than pedigerous somites together; seen from above it is widest across the branchial regions; its depth is three-fourths its length and is equal to greatest breadth; there is an obsolete median carina on the back, while on each side a dorso-lateral, horizontal, elongate tumidity runs backwards from the pseudorostral lobes for greater part of the length of the carapace; below this elevation is a shallow depression; anterior margin and inferior edge finely serrate. Antero-lateral margin a little sinuate, scarcely at all concave, and antero-lateral angle widely rounded, serrate. Pseudorostral sutures fused; lobes meeting in front of ocular lobe for a distance equal to about one-seventh length of carapace, anteriorly widely gaping.

Pedigerous somites one to three wider than carapace; the third somite is shorter on the dorsum than any of the others, but the pleural parts of second and

third somites are considerably expanded laterally and are longer than in the others.

Pleon stout, not very much shorter than cephalothorax; fifth somite about one-fourth as long again as sixth, which is little longer than wide; telson less than two-thirds as long as sixth somite, subcylindrical rather than subtriangular, with two tiny apical spines, and with lateral margins weakly serrate.

First antenna somewhat geniculate between second and third segments of peduncle; first joint with inner margin strongly serrate; second joint short, less

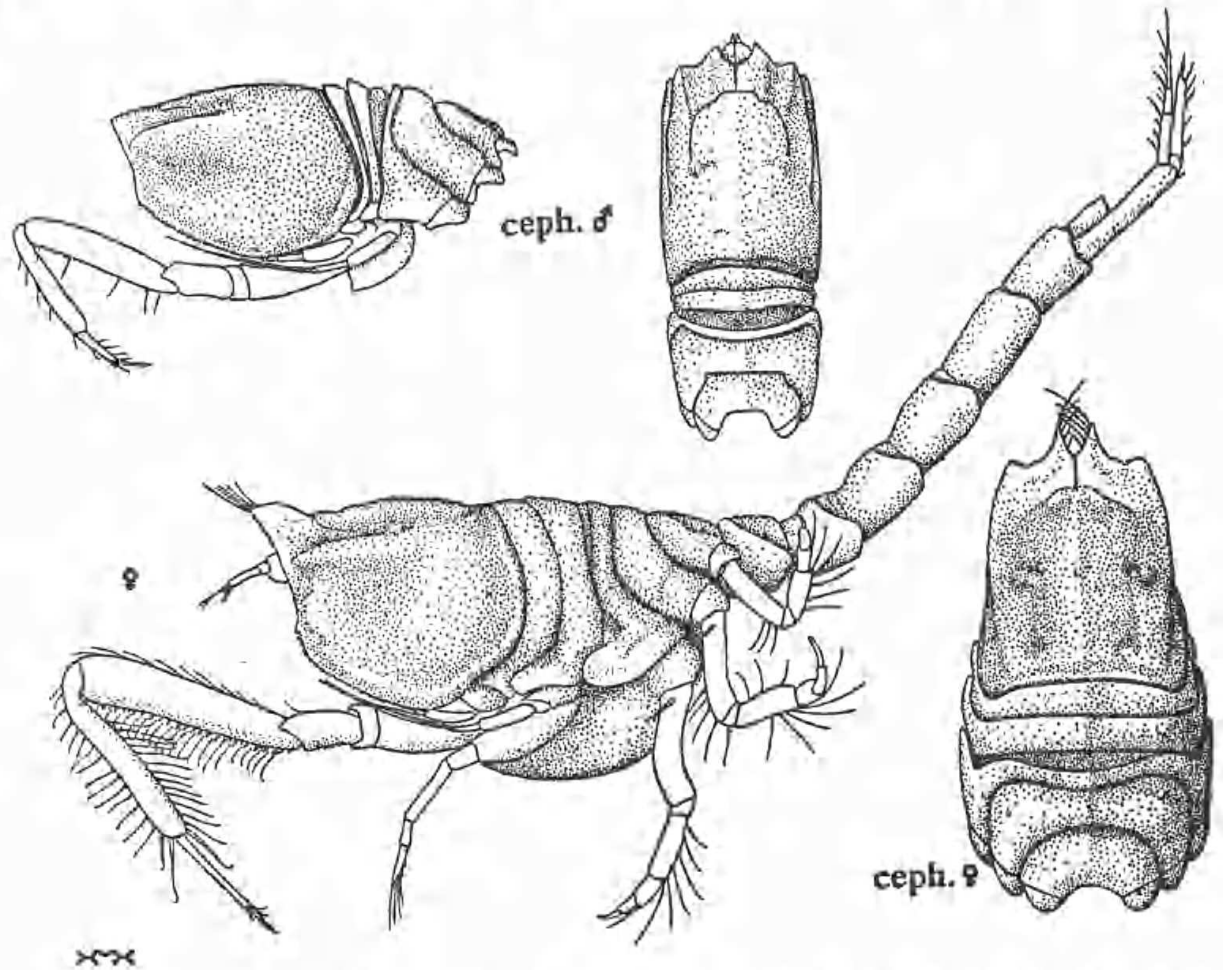


Fig. 49. *Dicoides fletti*. Type female; lateral view and (ceph.) cephalothorax from above. Paratype subadult male; ceph., cephalothorax from the side and from above (all $\times 15$).

than half as long as the third, which is long (subequal in length to first); flagellum three-jointed, the first segment twice as long as second and third together; accessory lash three-jointed and longer than first segment of main flagellum.

Second antenna three-jointed.

Third maxilliped with basis shorter than rest of appendage, somewhat expanded distally, but scarcely produced forwards; propodus subequal in length to dactylus and not as long as merus and carpus together; exopod absent.

First pereopod massive, the merus reaching to anterior margin of carapace, fully two-thirds total length of the limb extending beyond this level; basis short, less than one-fourth as long as rest of limb; carpus as long as basis, ischium and merus together, less than one-fourth as long again as propodus, with margins dentate and furnished with long setae; propodus similar in structure to carpus and with three or four of the distal setae conspicuously stouter than the others;

dactylus narrow, subcylindrical, distally with several special setae and a strong, irregularly serrate claw (top left in fig. 50).

Second peraeopod with basis serrate on outer margin, not as long as remaining joints together; ischium obsolete; carpus slender, two and one-half times as long as merus, and nearly half as long again as propodus and dactylus together; propodus fully three-fourths as long as dactylus, which bears a series of slender setae but no spine.

Third and fourth peraeopods robust, each with small two-jointed exopod;

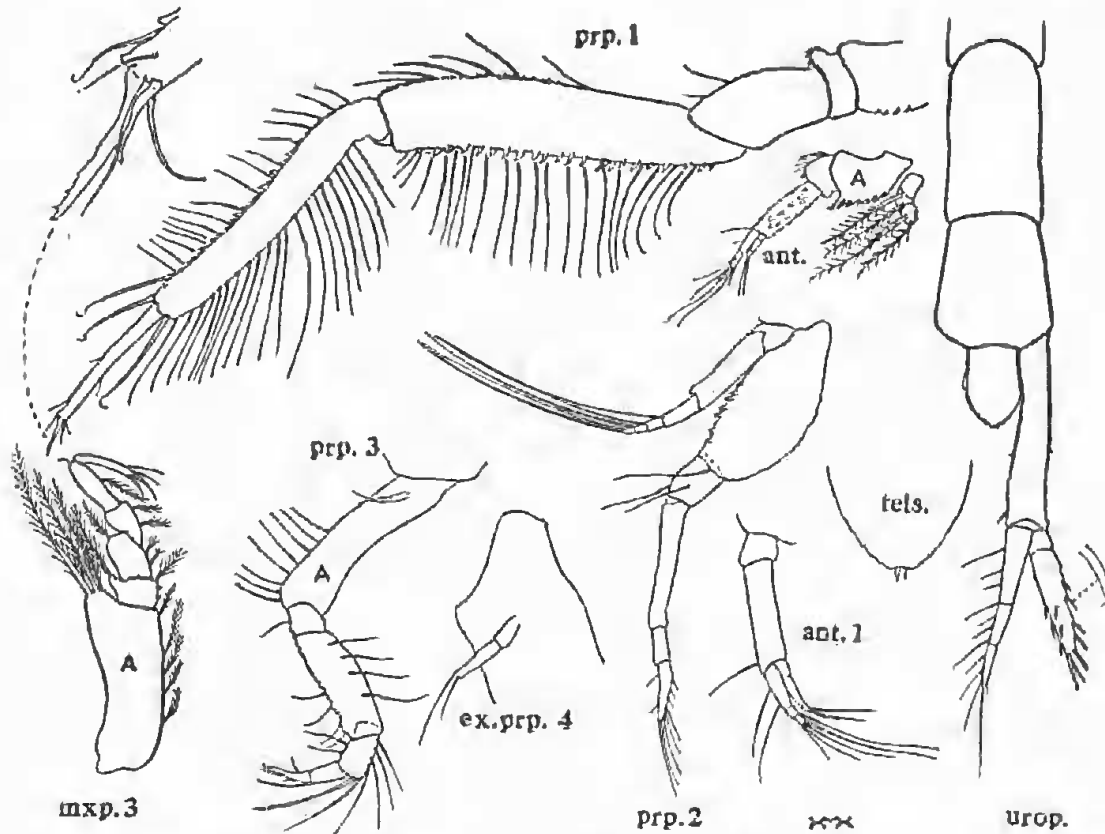


Fig. 50. *Dicoides fletti*, type and (A) paratype ovigerous females; ant., antenna ($\times 55$); mxp. and prp., third maxilliped and first to third peraeopods ($\times 30$; dactylar claw of first leg, $\times 94$); ex. prp. 4, exopod of fourth peraeopod ($\times 94$); urop., uropod with fifth and sixth pleon somites and telson ($\times 30$); tels., distal end of telson ($\times 94$).

basis not much shorter than rest of limb; merus as long as the three terminal joints without dactylar claw; fifth peraeopod the same size excepting that basis is a little shorter.

Peduncle of uropod nearly two and one-half times as long as telson, and fully as long as fifth pleon somite; endopod five-sixths as long as peduncle, one-fourth as long again as exopod, with unequal inner setae (see figure) and with a long terminal seta, half the length of ramus; it is three-jointed, the proximal segment almost as long as the other two (which are subequal in length) together; exopod with longitudinal rows of stout spines, the terminal ones reaching to level of distal end of endopod.

Colour white. Length 5.3 mm.

Subadult males. The carapace is not dilated across the branchial regions and the upper edge of the elongate dorso-lateral tumidity is more ridge-like; also more distinctly marked is a ridge-like fold on each pseudorostral lobe in front of eye lobe; the ocular lobe is distinctly delineated.

First and second pedigerous somites shorter than in female, but nevertheless longer dorsally than third, which is reduced to a narrow strip, but has the pleural parts well expanded backwards.

The first to fourth peraeopods bear moderately well-developed exopods, although the peduncle is barely wider than in anterior pairs of female; those of the third and fourth pairs have the setae not fully developed.

There is no trace of pleopods.

Length 4.6 mm. and thereabouts.

Loc. Tasmania: Babel Island, 39° 55' S., 148° 31' E., 25 metres, inshore station, surface (type loc., "Warreen" Station 29, N. 200, Jan., 1939). New South Wales: off Eden, 30 and 60 metres, in coarse sand and in silt (K. Sheard, A. Trawl and submarine light, Oct., Nov., and Dec., 1943); 4 miles off Port Hacking, 80 metres, on mud (K. Sheard, A. Trawl, May, 1944); Ulladulla, 75 metres (K. Sheard, A. Trawl, June, 1944). Type female in South Australian Museum, Reg. No. C. 2341.

This easily recognized species is named after Capt. A. Flett, Master of the "Warreen."

The dactylus of the first peraeopod is shorter in immature males and females than it is in the adult; also the marginal setae of the limb are sparse, but this applies also to some of the almost mature examples, and to ovigerous females from Ulladulla, which are smaller (5 mm.) than the type. The reticulate patterning is always distinct on the carapace, but the sparse granulation is not constant.

As in some species of *Gynodiastylis* pellucid spots, like those often occurring in *Campylaspis*, etc., are apparent on the carapace of a few examples.

The first antennae often have a prominent squamose sculpturing, particularly on third peduncular joint; the accessory flagellum may be slightly shorter than in the type (fig. 50, A) and only as long as the long first joint of main lash.

The median contact length of the pseudorostral lobes varies slightly.

GENUS ALLODIASTYLIS Hale.

Alloidiastylis Hale, 1936, p. 426, and 1937, p. 72.

The main distinguishing features are the slender upturned pseudorostrum, furnished with long setae at the tip, of the female and young male, and the character of the first antenna. The latter is long for the group (about half as long as carapace in the female) and has the first and second joints of the peduncle dilated and together not longer than the elongated third segment.

In combination with these characters the female completely lacks thoracic exopods and the telson is elongate, subcylindrical, and with no definite post-anal part. The second antenna of the female projects (relatively) well beyond the anterior margin of the carapace, it is apparently four-jointed, but the sutures of the terminal conical part, though discernible, do not separate distinctly the last three joints (see fig. 56, ant. 2). The first peraeopod is moderately long, with the dactylus normal for the family, and the propodus and carpus subequal in length. The most distal of the carpal setae of the third to fifth peraeopods is not very stout and is not shorter than the other or others.

The distal spines on the telson of the adult male (as known in two of the species) are long and bristle-like. This separates the male from that of all related genera except *Zimmeriana*, where similar sexual dimorphism occurs, but there the first antenna and first peraeopod are distinctive.

The endopod of the uropod is two-jointed in both sexes of the four species which fall here. The first antenna exhibits some variation. In *hirtipes* and

johnstoni spp. nov. it is much as in the genotype but in *tenuipes* sp. nov. the first two segments are dilated to a greater extent and resemble more the condition found in *Sheardia*.

The gap between second and third peraeopods varies in the species, as in *Gynodiastylis*.

The integument is calcified and brittle and is of a chalky, somewhat opalescent appearance in the female. It is translucent in the adult male, in which, as previously described, the carapace differs from that of the female and young male to an extraordinary degree.

KEY TO SPECIES OF *ALLODIASTYLIS* (FEMALES)

- | | | |
|--|---------|---------------------------|
| 1. Rami of uropod equal in length | | <i>hirtipes</i> sp. nov. |
| Exopod of uropod much longer than endopod | | 2. |
| 2. Uropod with peduncle not longer than telson and with segments of endopod subequal in length | | <i>johnstoni</i> sp. nov. |
| Uropod with peduncle longer than telson and with first segment of uropod much shorter than second | | 3. |
| 3. First antenna with first two segments of peduncle greatly dilated (each as deep as long) and with flagellum more than half as long as third peduncular joint. Propodus of second peraeopod more than half as long as dactylus. Posterior limbs slender, the third longer than carapace | | <i>tenuipes</i> sp. nov. |
| First antenna with proximal segments moderately dilated (each longer than deep) and with flagellum less than half as long as third peduncular joint. Propodus of second peraeopod less than half as long as dactylus. Posterior limbs not unusually slender, the third shorter than carapace | | <i>cretata</i> Hale. |

ALLODIASTYLIS *HIRTIPES* sp. nov.

Ovigerous female. Integument with sparse, tiny granules, thickest on carapace, but present also on pedigerous and anterior pleon somites.

Carapace less than one-third of total length of animal, as deep as broad, and a little more than half as long again as wide; it has an elongate swelling (dorso-lateral fold) immediately below the frontal lobe, a small, rounded tumidity at each rear corner of frontal lobe and the median portion of last-named elevated and rounded; posterior to the frontal lobe the dorsum is concave, the hollow emphasized by swollen lateral edges; on the sides is a large shallow depression. Antero-lateral margin very shallowly excavate; antero-lateral corner angularly rounded, armed with small denticles which continue along almost whole length of inferior margin. Pseudorostrum long, with spaced spinules below, very narrowly truncate in front; lobes meeting in front of ocular lobe for a distance equal to about one-third of total length of carapace. Frontal lobe broad; ocular lobe short, more than twice as wide as long, with no distinct lenses.

Pedigerous somites together more than half as long as carapace, not differing very conspicuously in length on the back; second with pleural parts produced forwards as small lobe; third produced fore and aft on the side, the second and third peraeopods being well separated.

Pleon narrow, shorter than cephalothorax; fifth somite not much longer than sixth, which is somewhat broadened posteriorly, where it is slightly wider than long; telson slender, three-fourths as long again as sixth somite, with lateral margins serrate for greater part of length and with a pair of rudimentary spines at apex, flanked on each side by a similar lateral spine and a bristle.

First antenna much as in genotype; flagellum one-third as long as third peduncular segment, two-jointed, the first joint somewhat longer than the three-segmented accessory lash.

Mandible with the usual nine to ten spines.

Third maxilliped with basis not a great deal shorter than rest of limb; carpus longer than any other of remaining joints; propodus and dactylus of equal length.

Basis of peraeopods with long setae which hold a dense matting of flocculent material. First leg, when extended, with carpus reaching beyond antennal angle, and dactylus beyond level of front of pseudorostrum; basis half as long as remainder of limb, its distal end encircled with stout teeth; propodus subequal in length to carpus and one-fourth as long again as dactylus.

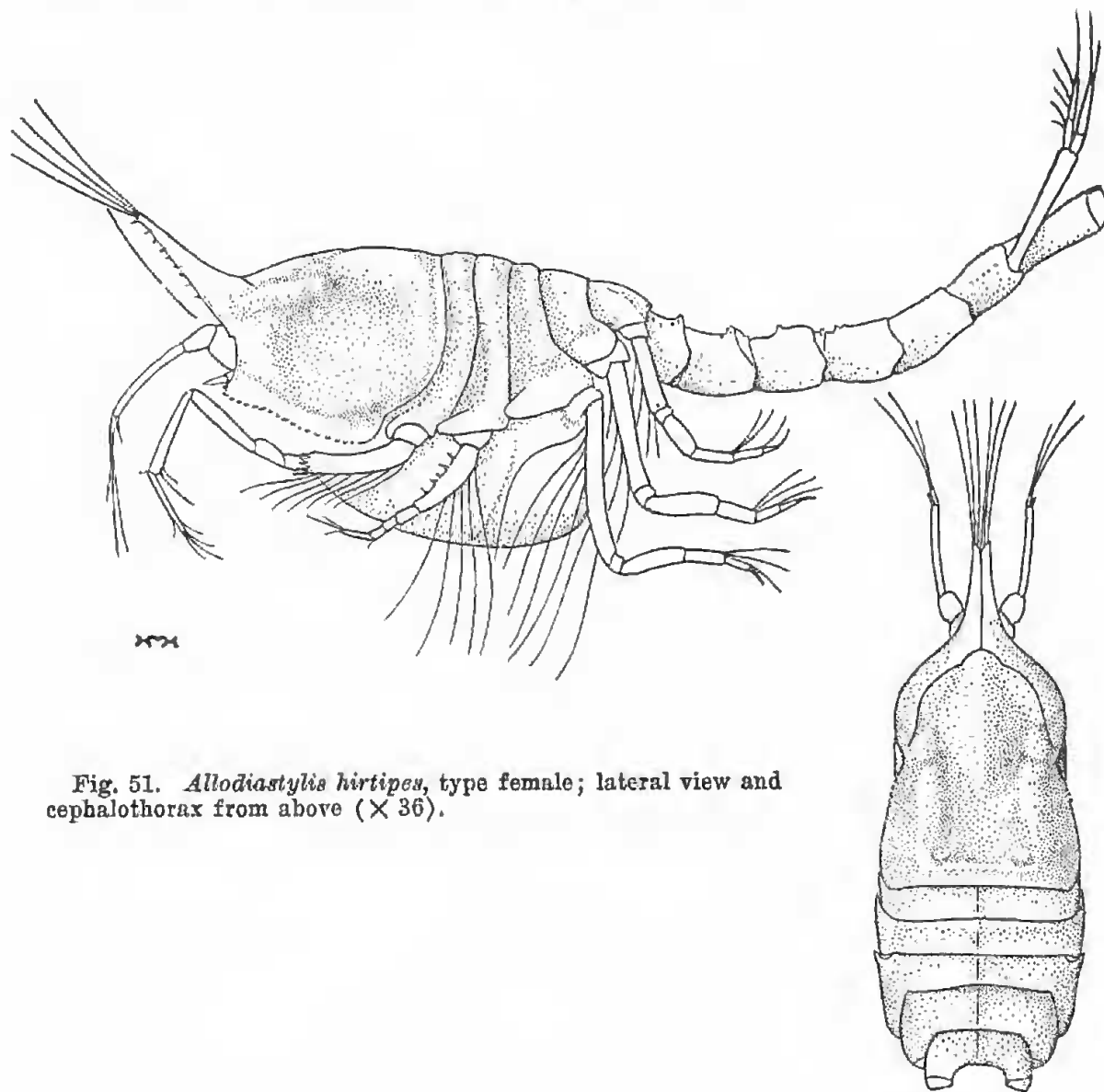


Fig. 51. *Allodiastylis hirtipes*, type female; lateral view and cephalothorax from above ($\times 36$).

Second peraeopod short (not much more than one-third as long as first) with the narrow basis equal in length to rest of limb and spinose on inner margin; ischium suppressed; merus longer than carpus or propodus, which are subequal in length, each barely more than half as long as dactylus.

Basis of third peraeopod as long as remaining joints combined, that of fourth distinctly shorter, in third half as long; merus of third and fourth pairs about as long as carpus and propodus combined; carpus with two distal setae, subequal in length and, like propodal seta, reaching a little beyond level of tip of dactylus, which is long and slender.

Peduncle of uropod narrow, a little longer than telson and two-thirds as long again as rami, which are equal in length; first of the two segments of endopod with two inner setae and three-fourths as long as second joint, which bears three long inner setae and a slender terminal spine almost as long as ramus; exopod with a few short spines on outer margin and two unequal slender distal spines, one of which is fully as long as the ramus.

Colour creamy with the faintly pearly appearance noted in all species of the genus. Length 3.15 mm.

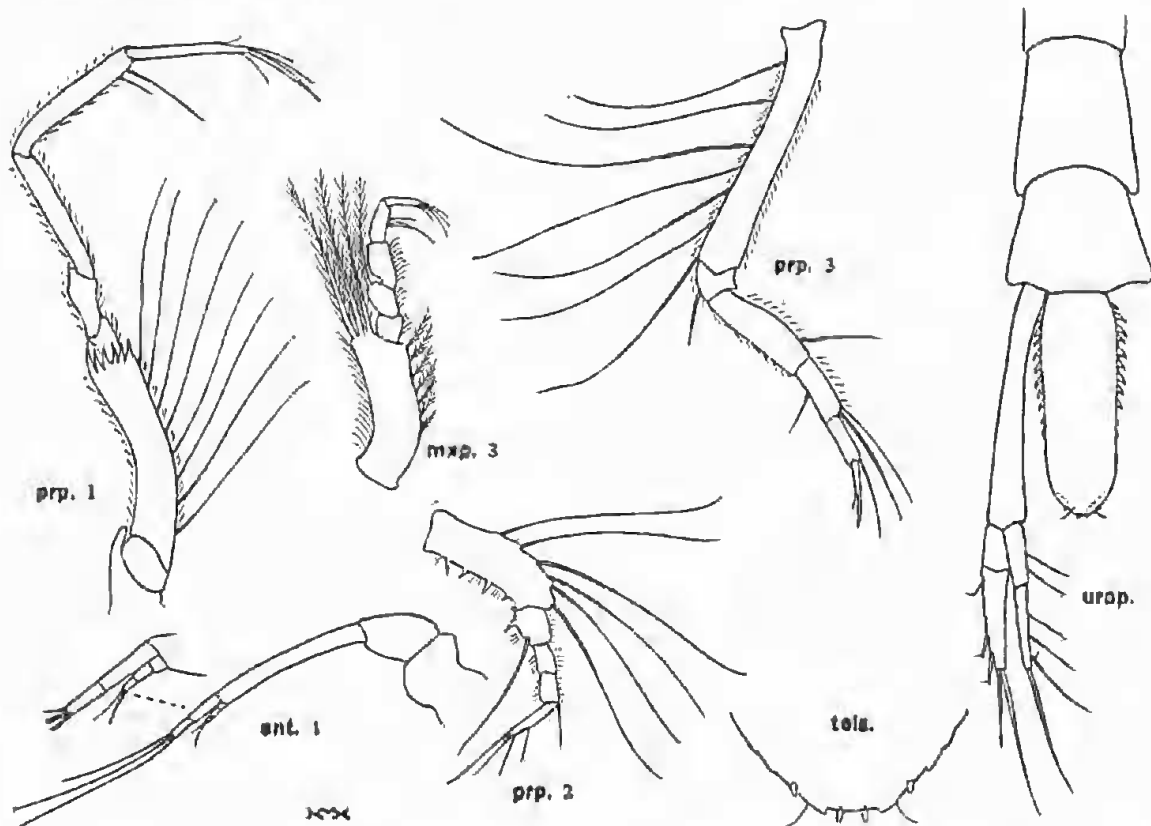


Fig. 52. *Allodiastylis hirtipes*, paratype ovigerous female; ant., first antenna ($\times 80$; flagella, $\times 125$); mxp. and prp., third maxilliped and first to third pereopods ($\times 80$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 80$); tels., distal end of telson ($\times 320$).

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt (type loc., K) Sheard, Oct., 1943); 4 miles off Port Hacking, 80 metres, on mud (K. Sheard, A. Trawl, May, 1944); Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Type female in South Australian Museum, Reg. No. C. 2719.

The slender respiratory siphons lie for the greater part of their length beneath the pseudorostrum. Probably the long setae of the pereopods are plumose but with the lateral elements so fine as to escape detection in the fouled condition which remains even after cleaning. Some examples have the granulation of the carapace a little more pronounced than in others; juveniles have the posterior pereopods shorter and stouter than in the adult.

Off Brush Island this species was taken in company with *tenuipes* but is at once separated by the more slender pseudorostrum and pleon, the less slender posterior pereopods with longer fringing hairs, and above all by the less dilated first and second joints of the peduncle of the first antenna and the very different proportions of the uropod.

ALLODIASTYLIS JOHNSTONI sp. nov.

Ovigerous female. Carapace as described for *cretata*, to which the species is closely allied; it is fully one-third of total length of animal and much longer than pedigerous somites together. Rostral siphons very long and wide.

Pedigerous somites not differing markedly in dorsal length, but successively becoming longer; second with pleural parts a little expanded forwards; third expanded fore and aft on sides, but second and third legs separated by a space no greater than that between third and fourth.

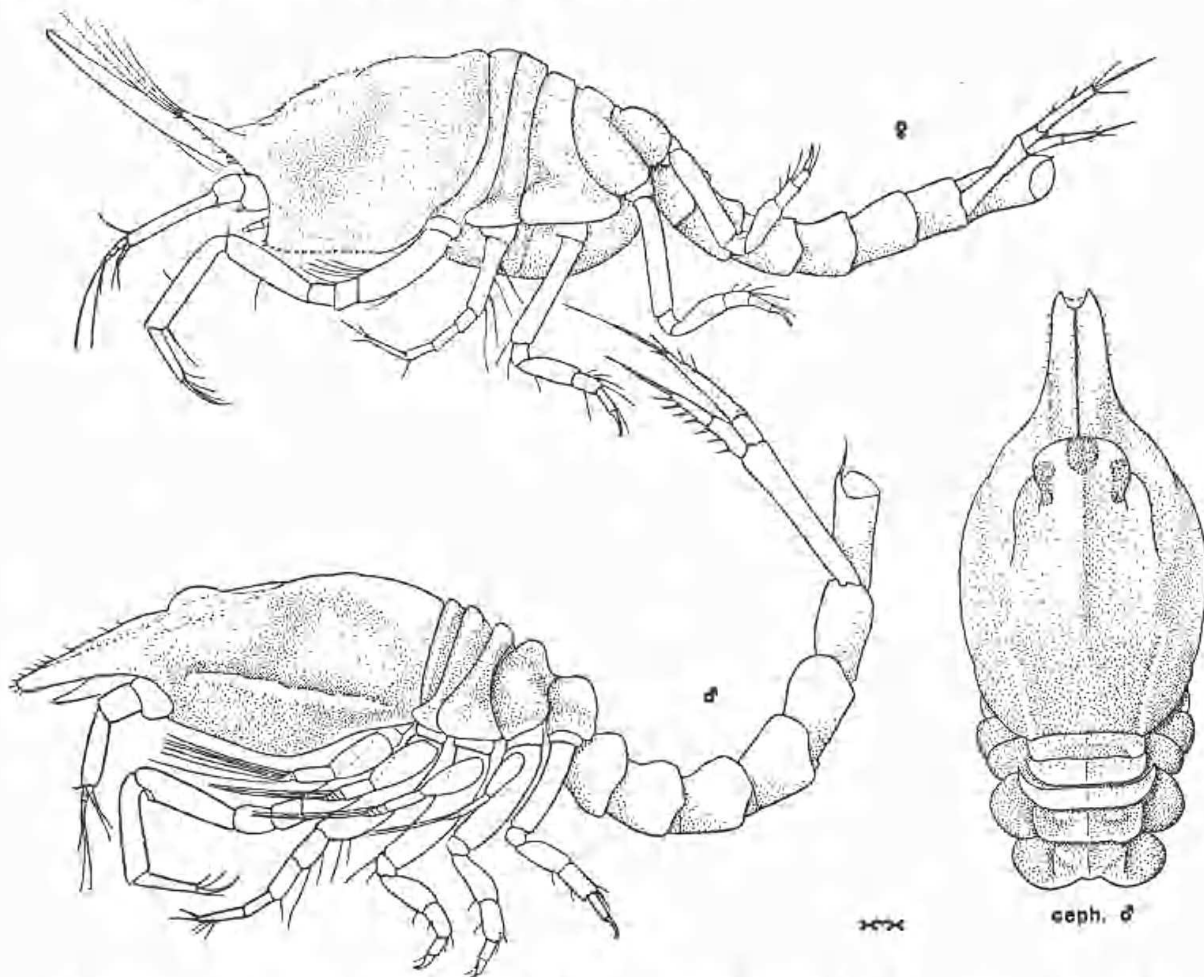


Fig. 53. *Allodiastylis johnstoni*, types female and male; lateral views and (ceph.) cephalothorax from above ($\times 42$).

Pleon cylindrical, the first to sixth somites not differing much in length, the fifth little longer than sixth, which is broadest in distal half, where it is half as wide again as long; telson cylindrical, with distal part suddenly tapering to the narrowly rounded apex which has a pair of rudimentary spines; it is nearly twice as long as the sixth pleon somite.

First antenna much as in genotype, with a distal spine below first two joints, which together are only about two-thirds as long as the elongate third segment; flagellum three-jointed, one-third the length of last peduncular joint; accessory lash also three-jointed, fully half as long as main flagellum.

Basis of third maxilliped short, broad distally, where the external part is forwardly produced; it is shorter than the first four joints of the palp and its

internal apical angle is spinose; remaining joints as in *tenuipes*; ischium and merus each with a small inner spine.

Basis in all peraeopods with a few long setae. First leg stout, when extended with carpus reaching well beyond antennal angle, and propodus past apex of pseudorostrum; basis short, barely more than one-fourth of length of rest of limb, with a few spines on distal margin; carpus and propodus subequal in length, each almost half as long again as dactylus.

Second peraeopod nearly half as long as first; basis three-fifths as long as rest of limb; ischium suppressed; carpus barely longer than merus but distinctly longer than propodus, which is two-thirds as long as dactylus.

Basis of third peraeopod slightly longer than remainder of limb, that of fourth barely shorter; merus of third and fourth pairs about as long as carpus and propodus together; propodal seta and longest carpal seta not reaching beyond tip of dactylus, which is not markedly elongate.

Peduncle of uropod dilated distally, not quite as long as telson and as long as exopod, which is one-fourth as long again as endopod; longest terminal spine of exopod slender, a little shorter than the ramus; endopod with first joint slightly longer than second and with long terminal spine distinctly less than length of ramus.

Length 2.17 mm.

Adult male. Integument translucent, crisp but not highly calcified; surface of carapace with coarse reticulate patterning which is seen with difficulty because of the transparency.

Carapace large, about two-fifths of total length of animal, depressed, fully one-third as wide again as greatest depth; on each side there is a marked dorso-lateral swelling in anterior half, below which the sides are concave; at the rear of this lateral hollow the hinder parts of the sides are tumid and below it is a greatly elevated fold; on the dorsum there is a sharp, median longitudinal carina running from ocular lobe to about three-fourths of length of carapace; the back is depressed on each side of this ridge, but rounded at the rear, where there is a pair of low dorso-lateral carinae; finally, there is a similar pair of ill-defined dorsal ridges on each pseudorostral lobe. Antero-lateral angle narrowly rounded, not serrate. Pseudorostrum long, blunt and downbent, the lobes meeting for a distance equal to one-third of length of carapace; it bears short hairs (in no way like those of the female and young male) and is feebly serrate below. Frontal lobe distinctly delineated; ocular lobe tumid, very large, twice as wide as long and much bigger than in female with three larger eyes exhibiting a granular structure.

Pedigerous somites together less than half as long as carapace; the first three are crowded so that the anterior angle of pleural parts of second overlap first and even carapace; pleural parts of third to fifth swollen, rounded, those of third moderately expanded fore and aft; the back of each somite is elevated, the tumidity bounded by a longitudinal carina on each side in fourth and fifth somites.

Pleon much shorter than cephalothorax, stouter than in female, but with sixth somite not much broader than long and not shorter than fifth; telson stouter than in female, less than half as long again as sixth somite, with the pair of slender terminal spines more than one-fourth of length of telson.

First antenna with peduncular joints less unequal in depth than in female; the stout third segment is as long as first two together; flagella subequal in length, each three-jointed (see fig. 54) and more than one-third as long as last segment of peduncle.

Second antenna richly furnished with fine setae; the flagellum consists of eleven short and stout segments, the proximal four not longer than wide; the lash is not as long as peduncle.

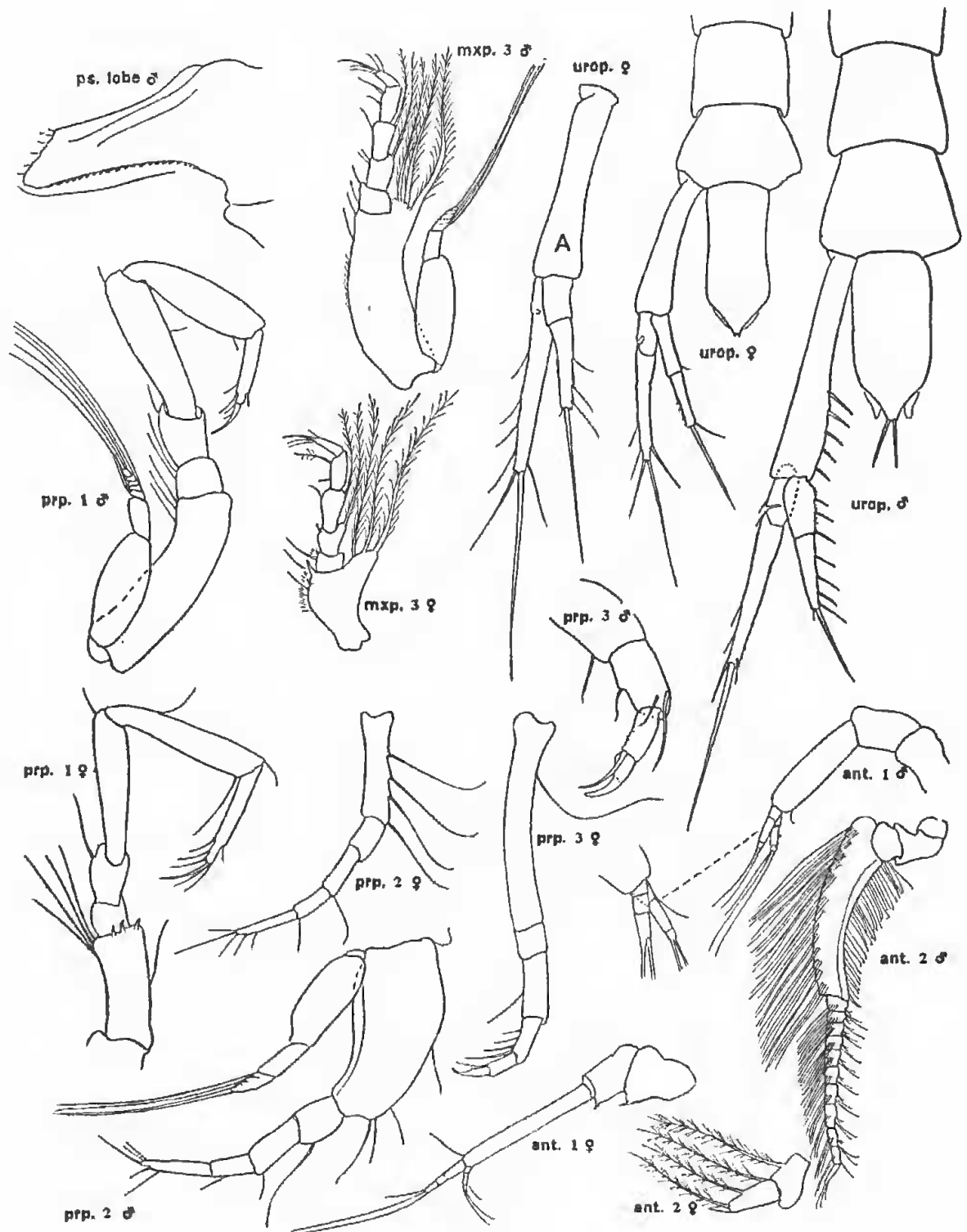


Fig. 54. *Alloidiastylis johnstoni*, paratype ovigerous female and type male; ps. lobe, pseudorostral lobe ($\times 75$); ant., first and second antenna ($\times 75$; second antenna of female, $\times 120$); mxp. and prp., third maxilliped and first to third pereopods ($\times 75$; distal joints of fourth leg of male, $\times 120$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 75$). A, Uropod of *A. cretata* for comparison ($\times 75$).

Third maxilliped with basis much larger than in female, longer than the palp; merus, carpus and propodus subequal in length, each longer than ischium or dactylus.

All peraeopods stouter than in female. First peraeopod broad, with basis half the length of combined remaining joints, which are of same proportions as in female; exopod stout, longer than basis.

Second peraeopod more than half as long as first, with basis almost as long as rest of limb; ischium suppressed; remaining joints about same proportions as in female.

Third to fifth peraeopods with distal carpal setae shorter than in female, but propodal seta reaching to tip of dactylus.

Peduncle of uropod one-third as long again as telson, dilated in distal half, where the inner margin bears five spines; exopod shorter than peduncle and with the main terminal spine stout and not quite as long as the ramus; endopod about two-thirds as long as exopod, and with first joint a little shorter than second; the proximal segment has three inner spines, the distal four and a stout terminal spine little longer than the joint itself.

Length 2.66 mm.

Loc. New South Wales: Sydney Harbour, Vaucluse, stones on reef (type loc., Prof. T. Harvey Johnston, Jan., 1937) and Shark Island, stones on reef (K. Sheard, Feb., 1938). Types in South Australian Museum, Reg. No. C. 2153.

An adult male only 2 mm. in length, from Shark Island, differs in some small details from the type; the peduncle of the uropod has six inner spines and the first segment of the endopod seven, while the setae of the fossorial limbs are relatively a trifle longer.

A. johnstoni perhaps should be regarded as a subspecies of the southern genotype, with which New South Wales examples were formerly placed (Hale, 1937, p. 73). As, however, specimens from the two localities differ consistently, a designation is necessary. *A. johnstoni*, like *cretata*, occurs on shore-line reefs, but the female of the last-named species has the peduncle of the uropod longer than the telson, the endopod of that appendage with the proximal segment less than two-thirds as long as the distal, while the terminal spines of both rami are longer (fig. 54, A.). Further, the propodus of the second leg is shorter, less than half as long as dactylus and not much more than half as long as carpus.

The male of *johnstoni* differs little from that of *cretata*, although in the last-named the propodus of the second leg, as in the females of the two forms, is relatively shorter, while the uropod has the terminal spine of the exopod and the first joint of the endopod both relatively shorter.

ALLODIASTYLIS TENUIPES sp. nov.

Ovigerous female. Integument rather coarsely granulate, the granules most distinct on carapace; on first two pleon somites the dorsum is spinose.

Carapace less than one-third of total length of animal, wider than deep and only one-third as long again as broad; dorso-lateral fold represented by an elongate swollen area below frontal lobe; dorsum medianly slightly elevated on, and a little beyond, frontal lobe, posterior to this concave, the slight hollow bounded laterally by low folds; to the rear of and below dorso-lateral fold the sides are depressed. Antero-lateral margin very shallowly concave; antero-lateral angle subacute, dentate, the serrations continuing along lower margin of carapace. Pseudorostrum feebly dentate below, not quite as slender as in genotype, the lobes meeting for a distance not exceeding one-fourth of length of carapace. Frontal lobe broad and ocular lobe short, almost three times as broad as long, without apparent lenses.

Pedigerous somites together about three-fourths as long as carapace, not differing markedly in length dorsally; first to third with pleural parts forwardly produced; the third is bent backwards on the sides also, so that the second and third legs are more widely separated than are the others.

Pleon rather robust, shorter than cephalothorax; fifth somite not longer than sixth, which is widened posteriorly, where it is slightly broader than long; telson stout, one-fourth longer than sixth somite, laterally serrate near base, and with a pair of rudimentary terminal spines.

First antenna with first and second segments of peduncle dilated more than in genotype, being considerably raised on the upper face; the first is as deep as it is long and has a large inferior tooth; third joint rather longer than first two

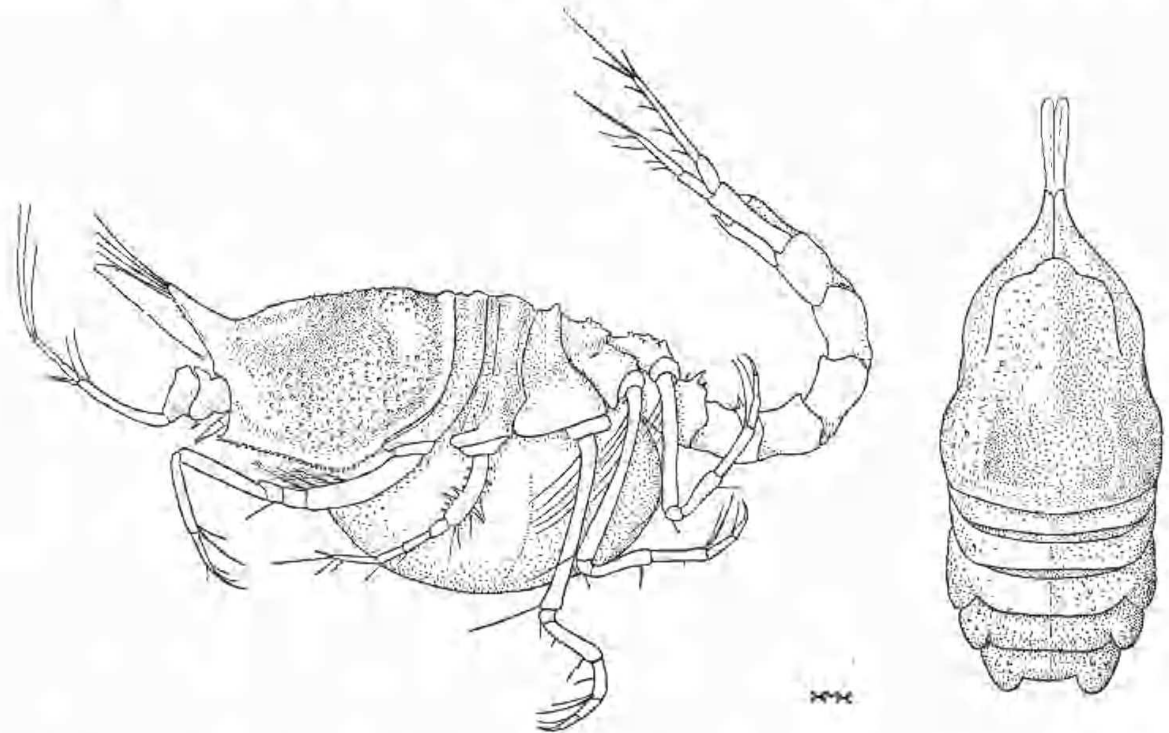


Fig. 55. *Allodiastylis tenuipes*, type female; lateral view and cephalothorax from above ($\times 40$).

combined; flagellum more than half as long as third segment of peduncle, two-jointed, with the second segment longer than first; accessory flagellum less than half as long as main lash and three-jointed.

Third maxilliped with basis wide and short, dilated and somewhat forwardly produced distally, and not quite as long as the first four joints of the palp; carpus and propodus subequal in length, each longer than any other of the remaining joints.

Basis in all peraeopods with a few moderately long setae. First leg when extended with carpus falling not far short of level of apex of pseudorostrum; basis only two-fifths as long as rest of limb with a few short spines at distal end; propodus distinctly shorter than carpus and fully twice as long as dactylus.

Second peraeopod slender, more than half as long as first leg, with the basis much shorter than rest of limb and dentate on inner and outer edges; ischium not apparent; merus subequal in length to the narrow carpus, which is barely longer than propodus; dactylus about two-thirds as long again as propodus with one of the distal setae long and slender.

Posterior peraeopods long and slender; basis in third longer than rest of limb, in fourth about equal to it, in fifth about two-thirds as long; merus of third and fourth pairs shorter than carpus and propodus together; carpus with two distal setae, unequal in length, the longer, and most distal, like propodal seta, reaching to apex of the long and slender dactylus.

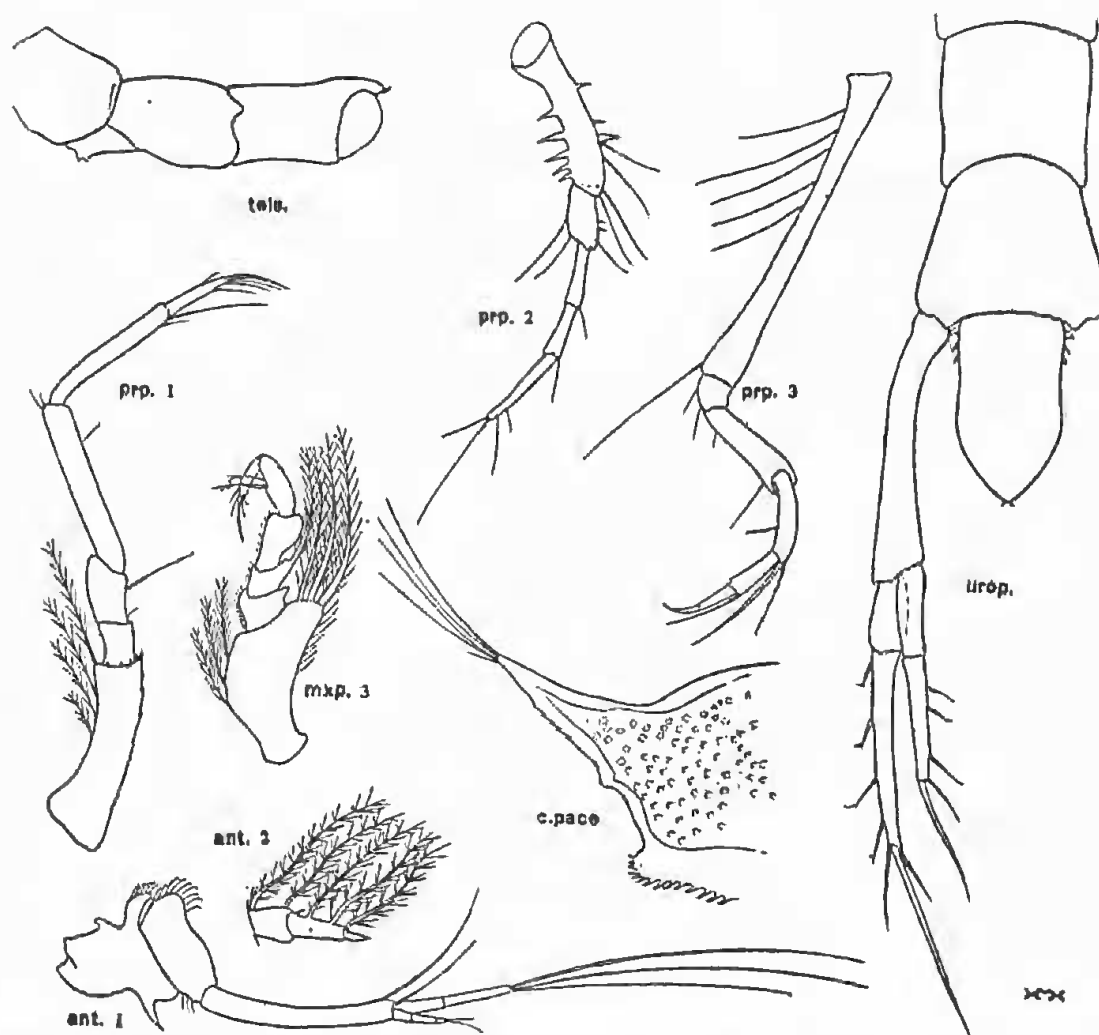


Fig. 56. *Allodiastylis tenuipes*, paratype ovigerous females; c. pace, anterior part of carapace ($\times 50$); ant., first and second antennae; mxp. and prp., third maxilliped and first to third peraeopods; urop., uropod with fifth and sixth pleon somites, and telson; tels., sixth pleon somite and telson from the side (all $\times 75$).

Peduncle of uropod rather narrow, more than one-third as long again as telson and equal in length to the exopod, which is more than one-fourth as long again as endopod; the latter has its first segment barely three-fourths as long as second, which has four inner setae and a slender flexible terminal spine equal in length to itself; exopod with four outer spines on second joint plus three unequal terminal spines, the longest of which is as long as the segment.

Length 2.46 mm.

Loc. New South Wales: Ulladulla, Brush Island, 45 fath., in fine silt on flathead grounds (D. Rochford, Jan., 1945). Type in South Australian Museum, Reg. No. C. 2702.

The respiratory siphons are large. In one example with the first peraeopods asymmetrical the shorter of the pair has the inner margin of basis, ischium and merus spinose.

GENUS ZIMMERIANA NOV.

Dic Zimmer (*nec* Stebbing) 1914, p. 190; Hale, 1936, p. 422.

This genus shares with *Allodiastylis* a complete absence of thoracic exopods in the female and the development of a pair of long terminal spines on the male telson. Added to these characters the modification of the first peraeopod is distinctive, the dactylus being large and subcylindrical, with an unusual arrangement of the setae, these radiating, mainly from the distal third, to form a brush unlike the dactylar furniture occurring elsewhere. As in *Allodiastylis* and *Dicoides*, the basis of the first peraeopod is very short in relation to the rest of the limb.

The pseudorostrum is almost horizontal in the female, decidedly downbent in the adult male; the telson is subcylindrical in both sexes. The second antenna of the male is short, the flagellum not exceeding the peduncle in length, the basis of the third maxilliped is rather strongly widened distally in both sexes and the mandible, as in *Gynodiastylis*, has about ten spines in the row (seven to eleven). The endopod of the uropod is trisegmentate in the female and young male, bisegmentate in the adult male.

Genotype *Dic lasiodactylum* Zimmer.

The genus is named after Dr. Carl Zimmer, who described the type species.

Only one adult male is available; this differs remarkably in form from the female but was associated with it in the first place by the unmistakable structure of the first peraeopod, just as in the related *Allodiastylis* the first antenna provided the key character.

KEY TO SPECIES OF ZIMMERIANA

1. Telson longer than peduncle of uropod and armed with spines ventrally *spinicauda* (Hale).
Telson not longer than peduncle of uropod and not spinose ventrally 2.
2. Oviparous female with pleon longer than cephalothorax and with anterior peraeopods long.
Carpus of first pair distinctly longer than basis and carpus of second about twice as long
as merus *longirostris* sp. nov.
Oviparous female with pleon not as long as cephalothorax and with anterior peraeopods
shorter and stouter; carpus of first pair only about as long as basis, and carpus of second
half as long again as merus *lasiodactyla* (Zimmer)

ZIMMERIANA SPINICAUDA (Hale)

Dic lasiodactylum var. *spinicauda* Hale, 1937, p. 69, fig. 5b (also Hale, 1936, p. 423-424, fig. 13, a-g.).

This form occurs in Spencer and St. Vincent Gulfs, South Australia; the adult male has not been taken yet. Apart from the character of telson and carapace the dactylus of the first peraeopod is relatively longer than in the other species referred to the genus.

ZIMMERIANA LONGIROSTRIS sp. nov.

Dic lasiodactylum Hale (*nec* Zimmer), 1936, p. 422 (part) and 1937, p. 69, fig. 5a.

Oviparous female. Integument not highly calcified, tough and not brittle; surface shallowly pitted.

Carapace not quite one-third of total length of animal and twice as long as pedigerous somites together; it is more than half as long again as deep, and as wide as deep; from above it sub-pyriform with pseudorostrum long and slender; on each side there is a slight concavity, margined above and below by a low,

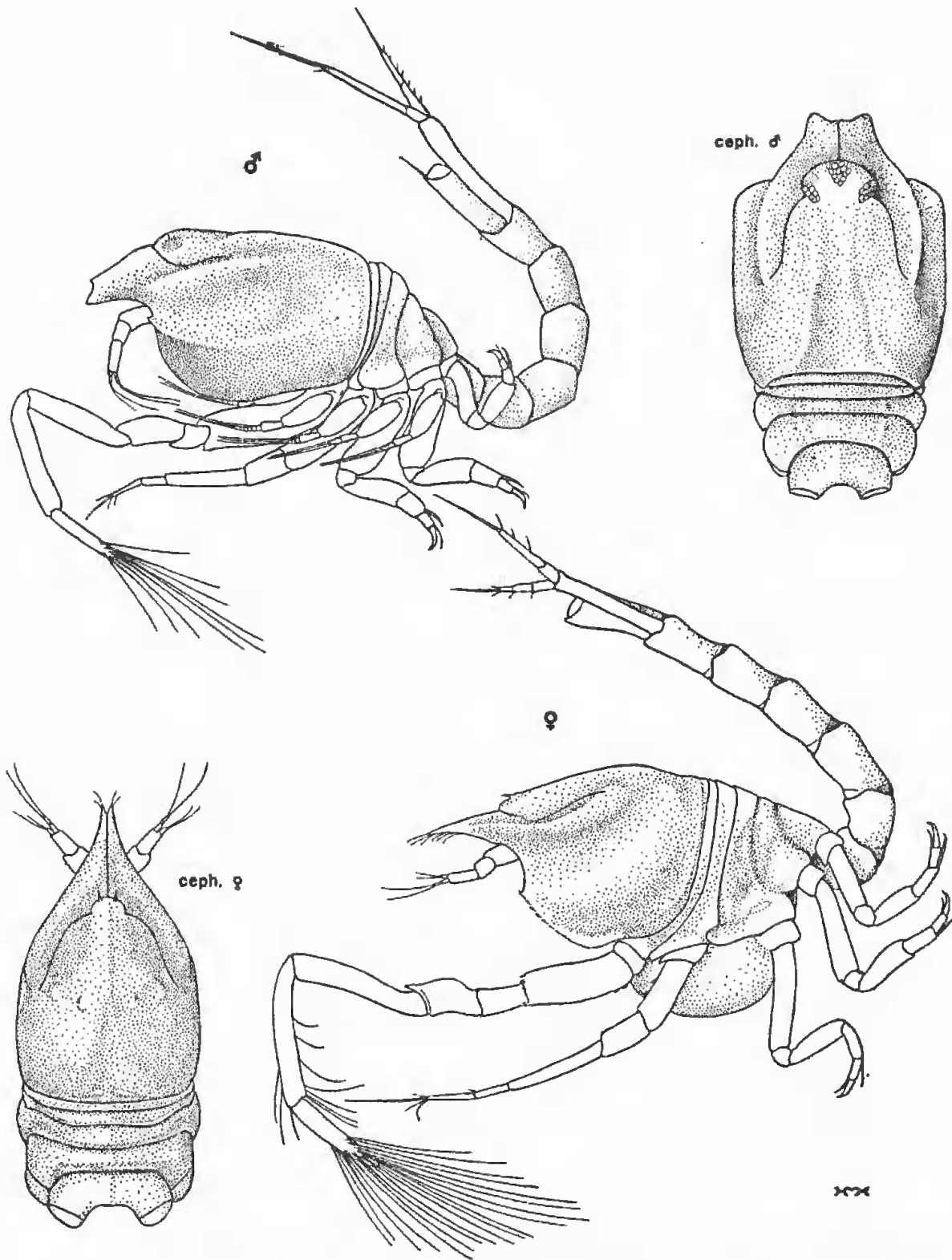


Fig. 57. *Zimmeriana longirostris*, type female and allotype male; lateral views and (ceph.) cephalothorax from above ($\times 40$).

rounded fold; the back is faintly excavate in posterior half and there is a pair of low, rounded elevations at posterior end of frontal lobe, which is indistinctly medianly carinate. Antero-lateral margin shallowly excavate; antero-lateral angle and margin posterior to it finely dentate. Pseudorostral lobes, as seen from above and also in lateral view, subacute in front, meeting for a distance equal to distinctly more than one-fourth of length of carapace. Frontal lobe distinctly marked off; ocular lobe rounded, rather small, wider than long, without apparent lenses and armed with a pair of slender denticles.

First and second pedigerous somites short, third and fourth equal in length dorsally, fifth longer; pleural parts of second expanded forwards, of third forwards and backwards, bringing the second and third peraeopods fairly wide apart; fourth somite fused with third, bent backwards on sides, there being a greater space between coxae of third and fourth legs than between fourth and fifth.

Pleon longer than cephalothorax; sixth somite relatively long, not shorter than fifth, dilated near posterior end, where it is about as broad as long; telson a little longer than sixth somite, cylindrical, with triangular apex armed with a pair of rudimentary spines.

First antenna with first joint of peduncle subequal in length to second and third together; second two-thirds as long as third; flagella two-jointed, the accessory flagellum as long as first joint of main lash (fig. 58, ant.).

Third maxilliped stout, with a strong tooth at distal end of ischium.

First peraeopod very long, the merus reaching level of apex of pseudorostrum; the short basis is only one-fifth of total length of limb and is armed with a few teeth, particularly at distal end; ischium and merus with distal teeth; carpus and propodus subequal in length, each longer than basis, and nearly half as long again as the dactylus, which bears a dense radial brush of setae.

Second peraeopod reaching forward to level of apex of pseudorostrum; basis very short, one-third as long as remaining joints together and much shorter than carpus; ischium obsolete; carpus twice as long as merus and longer than propodus and dactylus together; dactylus about one-third as long again as propodus and with one of the terminal setae robust, almost spine-like, and much longer than dactylus.

Third to fifth peraeopods successively decreasing in length; merus not much longer than carpus and propodus together; carpus with one stout distal seta which does not reach much beyond distal end of propodus, the seta of which is also unusually short.

Uropods slender; peduncle a little longer than telson and nearly twice as long as endopod, which is distinctly shorter than the exopod and consists of three joints, successively decreasing a little in length, and each with an inner seta at distal end; terminal spines a little shorter than their respective rami.

Colour dingy yellow. Length 2.6 mm.

Adult male. Integument transparent, but calcified and brittle. Carapace with coarse, somewhat reticulate, shallow pitting and with the lateral hollow margined above and below by a large fold; the lower fold projects as a prominent ledge, the carapace seen from above being thereby much broadened, and is considerably wider than deep; it is two-thirds as long again as depth, fully one-third of total length of animal and is more than twice as long as the pedigerous somites together; dorsum shallowly excavate. The summit of the lower lateral fold of carapace is elevated to form a narrow ridge, particularly distinct anteriorly, where it curves into the wide and shallow antennal notch, obliterating antennal angle, behind which the inferior margin is almost smooth. Pseudorostrum bent downwards (thus foreshortened in dorsal view of cephalothorax in fig. 57) with anterior

margin subtruncate and sinuate as seen from above and also from side; the lobes meet for a distance equal to almost one-fourth of length of carapace. Frontal lobe large and distinctly defined; ocular lobe rounded, nearly twice as broad as long, with three very large lenses showing granular structure.

Pedigerous somites with pleural parts not so markedly expanded as in female and coxae rather crowded.

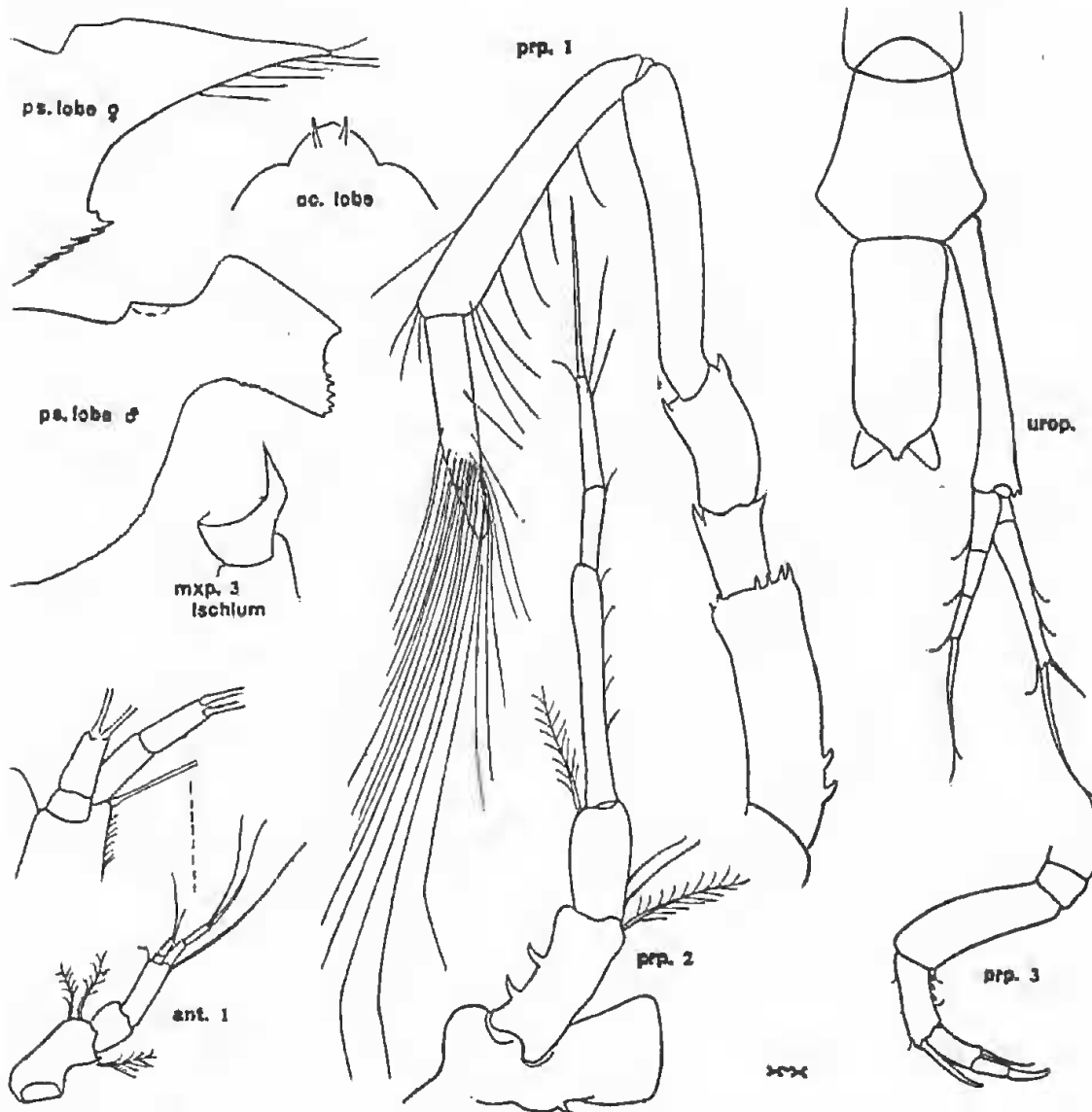


Fig. 58. *Zimmeriana longirostris*, paratype female; oc. lob. and ps. lobe, ocular and pseudorostral lobes ($\times 75$); ant., first antenna ($\times 75$; flagella, $\times 250$); mxp. 3 ischium, ischium of third maxilliped ($\times 125$); prp., first and second peraeopods, and third leg without basis ($\times 75$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 75$). ps. lobe ♂, Pseudorostral lobe of male ($\times 95$).

Pleon as long as cephalothorax; sixth somite slightly less dilated at rear than in female; telson more than one-third longer than sixth somite and with a pair of apical spines (each more than one-fourth as long as the telson) flanked by a pair of short bristles.

Main flagellum of first antenna three-jointed. Second antenna with flagellum eleven-jointed and not longer than peduncle.

Moderately well-developed exopods on third maxilliped and first four pairs of peraeopods. Third maxilliped with spine on ischium.

First peraeopod relatively shorter than in female but with basis longer, about one-fourth of total length of limb and as long as propodus.

Second peraeopod with basis more than half as long as rest of limb and longer than carpus; ischium obliterated; carpus half as long again as merus, and as propodus and dactylus together.

Third to fifth peraeopods with merus and carpus, as well as basis, stouter than in female.

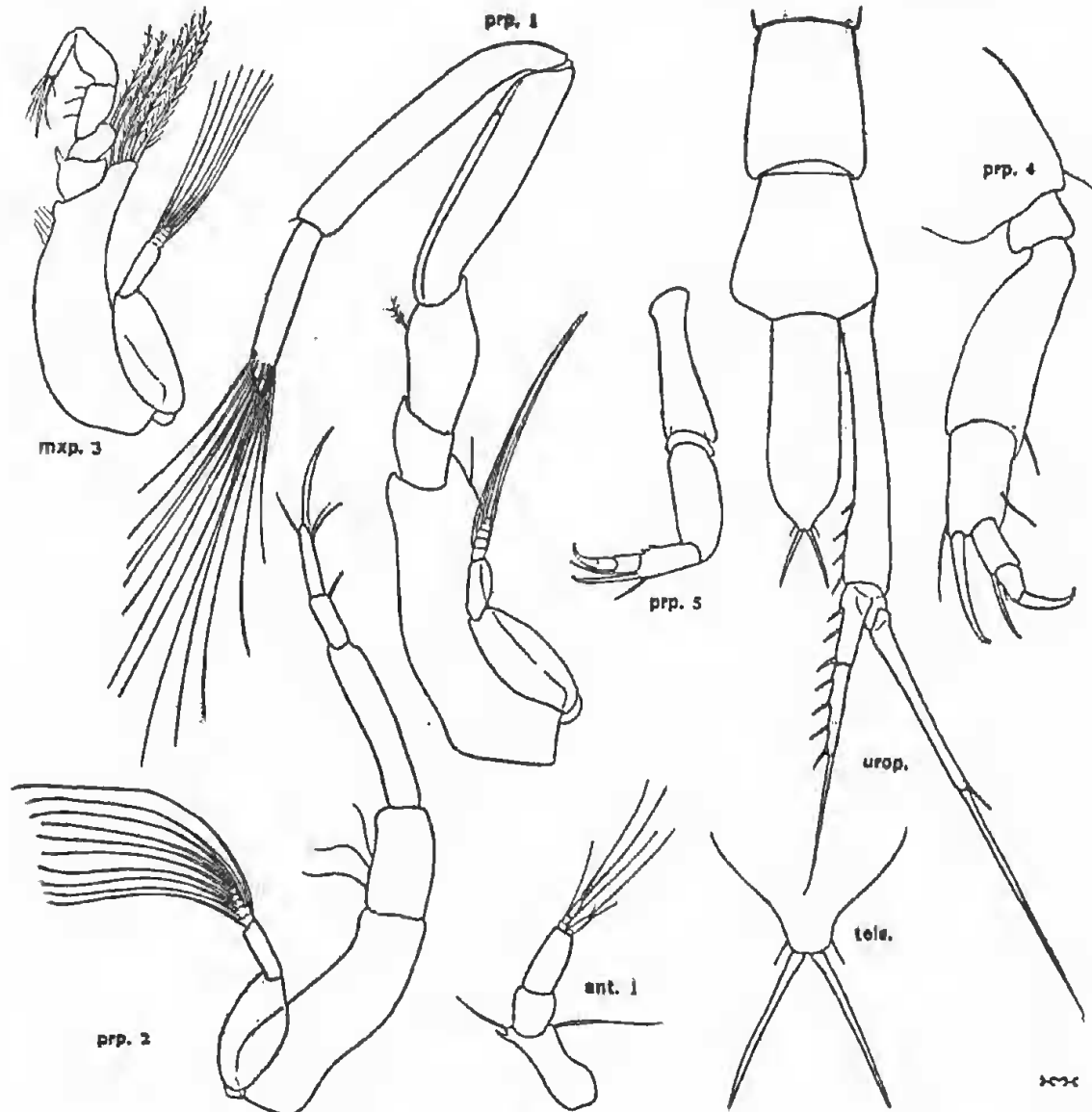


Fig. 59. *Zimmeriana longirostris*, type male; ant. and mxp., first antenna and third maxilliped ($\times 75$); prp. 1, 2 and 5, first, second and fifth peraeopods ($\times 75$); prp. 4, distal joints of fourth peraeopod ($\times 95$); urop., uropod with fifth and sixth pleon somites, and telson ($\times 75$); tels., distal end of telson ($\times 225$).

Peduncle of uropod one-fourth as long again as telson, and with four inner spines in distal third; endopod longer than in female, distinctly more than half length of peduncle and only two-jointed, the first with three inner spines and barely shorter than second, which bears four spines on inner margin and a slender terminal spine not much shorter than the whole ramus; exopod relatively longer and more slender than in female, one-third as long again as endopod with the main terminal spine as long as the ramus.

Length 2.3 mm.

Loc. South Australia: St. Vincent Gulf, Sellick's Reef, on stones, $\frac{1}{2}$ –1 fath. (H. M. Hale, Apl., 1936, type female and Mar., 1944); Page Islands, 9 fath. (type male, K. Sheard, submarine light, 7 to 7.30 p.m., Apl., 1941). Types in South Australian Museum, Reg. No. C. 2655 and 2658.

Allowing for the usual differences, the appendages of the male and female described above are so similar that one cannot doubt that they belong to the one species and that, as in *Allodiastylis*, there is considerable sexual dimorphism.

The first legs of the single male were folded together in a manner reminiscent of *Pomacuma*, etc. (Hale, 1944a, p. 234), the propodus bent back against the carpus, while the inner faces of propodi and dactyli were closely approximated, the whole limbs forming a sort of operculum; the distal ends of the carpal joints of these limbs were fitted intimately into the concave front ends of the pseudo-rostral lobes.

The ovigerous female of *longirostris* is very like that of *lasiodactyla*, but Zimmer describes and figures the pseudo-rostrum as being much shorter in his species, only one-fifth of the total length of carapace, the pleon is shown as shorter than the cephalothorax, while the peraeopods and uropods are stouter (see notes under *lasiodactyla* below).

ZIMMERIANA LASIODACTYLA (Zimmer).

Dic lasiodactylum Zimmer, 1914, p. 193, fig. 17–18; Hale, 1936, p. 422.

The adult female described above as *longirostris* was formerly regarded as representing a variant of this species, with anterior legs longer than in the type and than in some juveniles from Tasmania. Now, however, it is possible

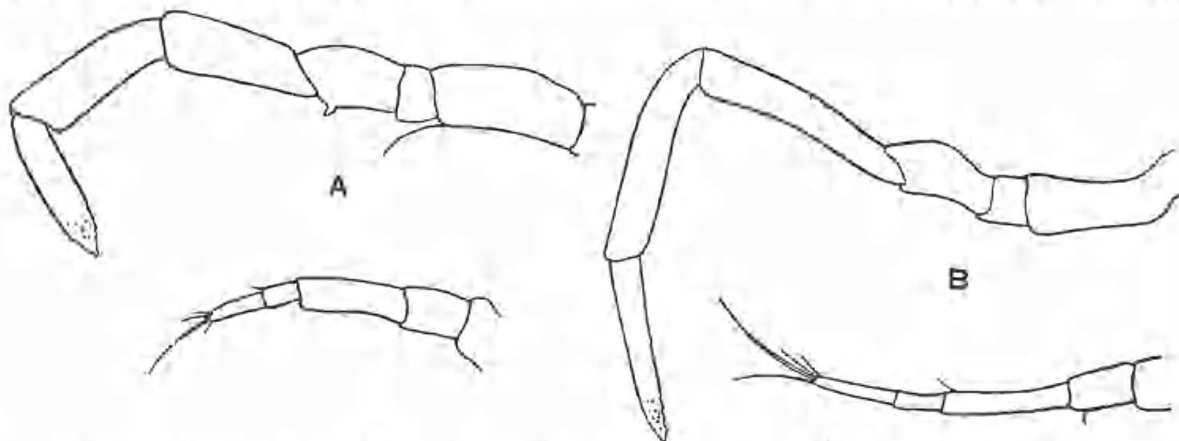


Fig. 60. First and second peraeopods of (A) *Zimmeriana lasiodactyla* and (B) *Z. longirostris*; the long dactylar setae of first peraeopod are omitted ($\times 70$).

to compare a long-legged female (*longirostris*) 1.55 mm. in length with a slightly larger female (1.75 mm.) of *lasiodactyla* from the last-named locality. Although owing to immaturity the proportions of the joints of the limbs are not quite as in the adult the differences are apparent in these examples of approximately the same stage, just as they are in the ovigerous female of *longirostris* and that described by Zimmer for *lasiodactyla*. Thus it seems that the two forms are consistently distinguished, Zimmer's species having the distal joints of the first and second peraeopods shorter and stouter than in *longirostris*, as well as the pseudo-rostrum, telson and uropods relatively shorter.

As in *longirostris* and *spinicauda* the ocular lobe bears a pair of spines, the only apparent difference from Zimmer's description.

SUMMARY.

Australian Diastylids belonging to *Gynodiastylis* and related genera are dealt with. These are distinguished by the facts that while the third maxilliped of the female lacks an exopod the male has no pleopods. The telson is variable, usually with post-anal part short and sometimes unarmed or almost so; it exhibits sexual difference in two of the genera.

The genera represented are *Sheardia* gen. nov., *Gynodiastylis* Calman, *Dicoides* gen. nov., *Allodiastylis* Hale and *Zimmeriana* gen. nov.

Species described as new are *Sheardia antennata*; *Gynodiastylis rockfordi*, *G. lata*, *G. robusta*, *G. dilatata*, *G. strumosa*, *G. ampla*, *G. subtilis*, *G. carinirostris*, *G. polita*, *G. ambigua*, *G. attenuata*, *G. echinata*, *G. roscida*, *G. mutabilis*, *G. ornata*, *G. margarita*, *G. quadricristata*, *G. brevipes* and *G. concava*; *Dicoides areolata* and *D. fletti*; *Allodiastylis hirtipes*, *A. johnstoni* and *A. tenuipes*; *Zimmeriana longirostris*.

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